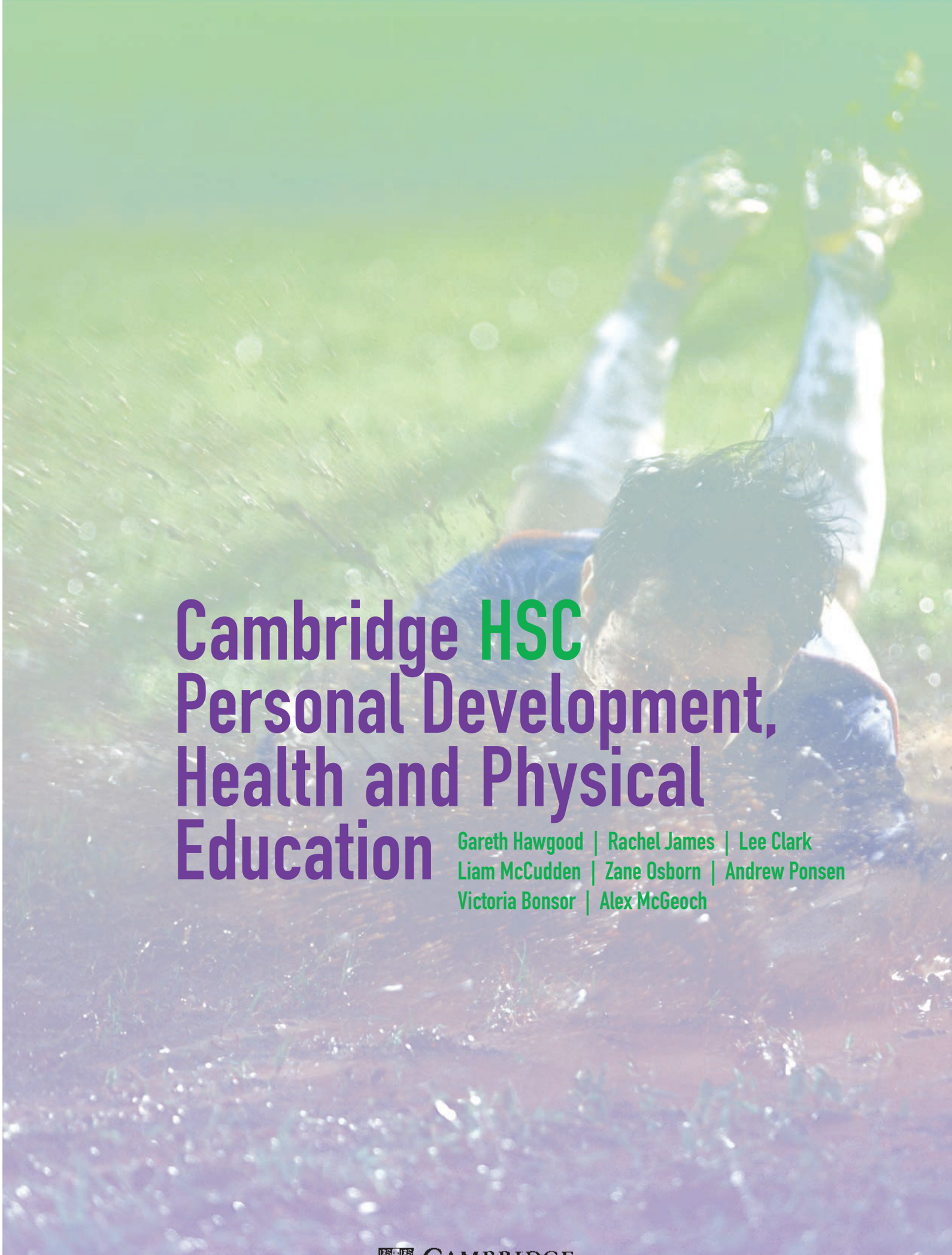

Cambridge HSC Personal Development, Health and Physical Education

Gareth Hawgood | Rachel James | Lee Clark
Liam McCudden | Zane Osborn | Andrew Ponsen
Victoria Bonsor | Alex McGeoch

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Contents

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Introduction

To the student

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

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

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

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

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

Good luck in your studies and your HSC exam, and we hope you enjoy HSC PDHPE!

Gareth Hawgood

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

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

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Alex McGeoch

Alex graduated from the University of Newcastle with a Bachelor of Physiotherapy in 2010. He then moved into clinical musculoskeletal physiotherapy in the private sector for three years before transitioning to a senior rehabilitation consulting position. Alex has a special interest in the optimal management of sporting injuries and has postgraduate training in sports injury management, casting and dry-needling.

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Chapter 1 Health Priorities in Australia

HSC Core 1

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

- *how Australia's health priority issues are identified*
- *the priority areas for the improvement of health in Australia*
- *the role played by health-care facilities and services in ensuring better health for all Australians*
- *what is required to address Australia's health priorities most effectively.*

Key terminology

advocacy
ancillary cover
atherosclerosis
benign
bulk-billing
determinants
environmental
epidemiology
health literacy
health status
healthy ageing
hypertension
incidence
inequality
inequity
inter-sectoral
life expectancy
malignant
Medicare
Medicare levy
Medicare levy surcharge
Medicare safety net
metastasis
morbidity
mortality
Pharmaceutical Benefits Scheme (PBS)
prevalence
social justice

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1.1 How Australia's health priority issues are identified

Measuring health status

Driving questions 1.1

1 How healthy do you think Australia is in comparison to the rest of the world?
2 What are the most pressing health issues in Australia today?
3 What information or evidence did you base your answers on?

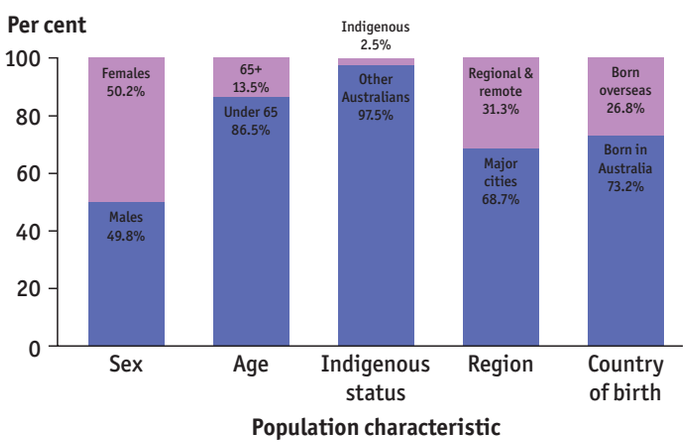
A snapshot of Australia

Compared with many other countries, Australia experiences a relatively high level of health. With a population of over 23 million, the nation measures quite high on the Organisation for Economic Co-operation and Development's (OECD) Better Life Index, which uses a number of economic and other measures to create a picture of the quality of life experienced in each country. It enables comparison across the 34 OECD countries, which are the world's major economies. Relatively speaking, Australians have above-average rates of employment, education and disposable income. **Life expectancy** is high, as are the senses of community, civic participation and feelings of positivity towards life in general.

life expectancy a measure of how long, on average, a person is expected to live

But the news is not all good. While we enjoy higher rates of employment, we also have significantly higher work hours than many other countries. Health issues such as obesity are on the increase and, despite the overall positive picture of the health of Australians, there are many groups within our population that experience severe disadvantage.

In terms of health, Australians face many areas of concern that require the focus and attention of the government and the health sector. In order to identify and address these areas of concern effectively, a comprehensive picture of the health status of our population must be created. This is achieved through the collection and analysis of data from various sources over a period of time.



Note: Data for sex, age, location of residence and country of birth refer to June 2010. Data for Indigenous status refer to June 2006.
Sources: ABS 2009a; ABS 2011a.

Figure 1.1 Proportion in each population group, 2010 (or latest year available)

Source: Australia's Health 2012, p. 48.

Role of epidemiology

To establish a health profile for a population and its sub-groups, various data need to be collected and compiled. The collection of these data is known as **epidemiology**, which refers to the study of health and disease in a population and its sub-groups over a period of time.

epidemiology the branch of medicine that studies the causes, distribution and determinants of disease in a population

Epidemiology provides vital information for governments and health organisations by showing the patterns of health and disease as well as the use of health services by the population in which they operate. Epidemiology is able to show trends in the prevalence (number of cases of disease in a population at a specific time) and

Going further 1.2

Collaborate
Visit the OECD website (see www.cambridge.edu.au/hscpdhpe1weblinks). In small groups, rate the topics you think are most important to a good life. Adjust the settings on the scale and see how Australia compares as a nation.

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incidence (number of new cases of disease in a population); it also provides insight into the apparent causes/determinants of disease.

Commonly used statistics in epidemiology include birth rates, mortality (death) rates, life expectancy, frequency and type of health-care services used, and the incidence and prevalence of disease.

Over recent years, the emergence of social media (e.g. Facebook, Twitter) has provided new and exciting avenues for epidemiologists and public health researchers to monitor outbreaks and the spread of diseases such as influenza. These avenues are cost-effective, and are able to provide information far quicker than more traditional methods such as hospital admission rates and health surveys. As the use of social media in epidemiology becomes more common and increasingly accurate, it has the potential to be a valuable tool for epidemiologists.

Epidemiology uses various measures to analyse a disease in terms of its:

- **prevalence** – the number of cases of a specific disease in a population at a specific time
- **incidence** – the number of new cases of a disease in a population
- **distribution** – the extent to which the disease affects the population
- **causes** – the factors that may have contributed to the development of the disease.

Who uses these measures?

Epidemiology allows public health researchers, governments, health organisations, manufacturers of health products and professionals delivering health services to compare and contrast patterns of health in a population at different points in time and among different sub-groups within a population. This allows those using epidemiological data to:

- identify health issues that may be specific to a particular group or area by measuring changes in health or differences between groups
- identify areas of inequity between population groups
- gain an overall picture of the health status of a population group or community
- allocate resources to effectively address specific health needs
- evaluate programs aimed at addressing illness and disease to gauge their effectiveness
- identify behaviours that may be contributing to the development of disease and take steps to change those behaviours
- promote behaviours that have a positive impact on the health status of the population.

Figure 1.2 Scientists working in a lab

Items commonly measured in epidemiology include:

- rate of births
- rate of deaths
- disease incidence
- injury incidence
- disease prevalence
- disability level
- financial cost
- use of hospitals and other medical services
- work days lost.

Health indicators are also used in epidemiological studies, including:

- **vital statistics** – illness, death, life expectancy
- **population surveys** – used to compare future and past data
- **surveillance** – data can be monitored and reported – for example, by the National Injury Surveillance Unit
- **health outcomes** – change in health due to intervention – for example, prevention, diagnosis and treatment.

Is everything about health status measured?

While epidemiology provides valuable data on health and disease trends in a population, it is important to acknowledge the limitations of such data. The major limitations of epidemiology include:

- providing an accurate representation of the inequalities in health status between population sub-groups
- providing reasons why these inequalities exist
- providing a measure of the impact a disease or injury can have on the quality of life
- measuring the impact that socio-cultural, **environmental**, socio-economic and individual determinants have on health.

environmental relating to a person's surroundings

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Going further 1.3

Inquire

Go to the ABS website (see www.cambridge.edu.au/hscpdhpe1weblinks) and look at the statistics menu page.

1 What kind of health-related information does the ABS collect?
2 What are the most recently produced reports on health from the ABS?

Limitations in methods of data collection also exist, which can be due to:

- an insufficient sample size being used
- the unreliability of data, due to such things as self-reporting
- whether or not standard measures are used
- multiple sources of information.

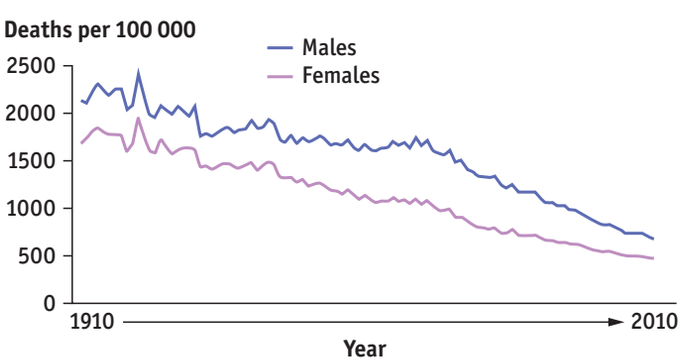
The Australian Bureau of Statistics (ABS) is a key body in the collection and analysis of data within Australia in relation to a broad range of topics, including health status. The data on health are collected through a variety of different mediums, including vital statistics, population surveys, surveillance and the measure of health outcomes. Due to its gathering of information from such a broad range of sources, the ABS is generally able to create an accurate picture of the health of the nation.

mortality the number of deaths from a specific cause or in a specific population over a period of time (usually one year)

Measures of epidemiology

Mortality

The **mortality** rate means the number of deaths from a specific cause or in a specific population over a period of time (usually one year). Mortality is a straightforward epidemiological measure that can be used to determine the major causes of death in a given population and the trends in causes of death; it can also be used to compare the causes of death across age, gender, years and other population sub-groups.



Note: Rates are age-standardised to the Australian estimated resident population for 2001.
Sources: ABS 2009f; ABS 2010c; AIHW 2010e; ABS 2011l.

Figure 1.3 Age-standardised mortality rates, 1910–2010
Source: Australia's Health 2012, Figure 2.19, p. 89.

Rank	Males			Females		
	Cause of death (code)	Number of deaths	% of all male deaths	Cause of death (code)	Number of deaths	% of all female deaths
1	Coronary heart disease (I20–25)	12 047	16.7	Coronary heart disease (I20–25)	10 476	15.3
2	Lung cancer (C33–C34)	4 761	6.6	Stroke (I60–I69)	6 706	9.8
3	Stroke (I60–I69)	4 514	6.2	Dementia and Alzheimer's disease (F01, F03, G30)	5 491	8.0
4	Chronic lower respiratory diseases (J40–J47)	3 209	4.4	Lung cancer (C33–C34)	3 025	4.4
5	Prostate cancer (C61)	3 111	4.3	Breast cancer (C50)	2 772	4.1
6	Dementia and Alzheimer's disease (F01, F03, G30)	2 786	3.9	Chronic lower respiratory diseases (J40–J47)	2 769	4.0
7	Colon and rectum cancer (C18–C21)	2 253	3.1	Diabetes (E10–E14)	2 050	3.0
8	Blood and lymph cancer (including leukaemia) (C81–C96)	2 175	3.0	Heart failure (I50–51)	1 884	2.8
9	Diabetes (E10–E14)	2 120	2.9	Diseases of the kidney and urinary system (N00–N39)	1 818	2.7
10	Suicide (X60–X84)	1 631	2.3	Colon and rectum cancer (C18–C21)	1 812	2.6
	Total 10 leading	**38 607**	**53.4**	**Total 10 leading**	**38 803**	**56.7**
	Total all causes	**72 320**		**Total all causes**	**68 440**	

Notes:
1 Causes of death for 2009 are derived using preliminary data and are subject to a revision process. For more information about revisions to mortality data, refer to ABS 2010e.
2 Codes refer to ICD–10.
3 ABS tabulations of leading causes are based on Becker et al. 2006. Cause groups based on this methodology are determined according to the level of cause detail available across a band of countries. There are other methods of grouping causes that are more relevant to individual countries, such as grouping causes for relevance to prevention strategies.

Table 1.1 Leading causes of death, by sex, 2009
Source: Australia's Health 2012, p. 93.

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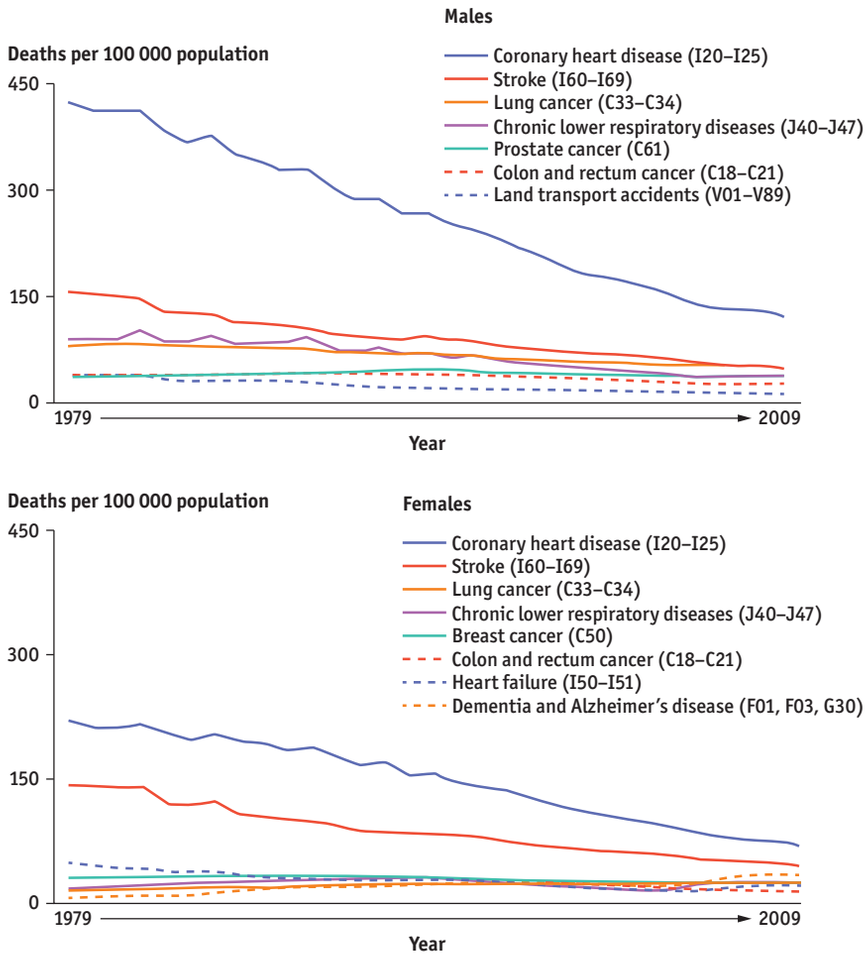

(a) Causes selected to reflect the leading causes of death, by sex, from 1979–2009.

Notes:

1 Leading causes groupings based on Becker et al. 2006.

2 Leading causes are determined by number of deaths by sex, each year. Causes that were consistently among the five leading causes of death by sex every year from 1979–2009 are indicated by a solid line. Causes that were among the five leading causes of death by sex for any one of the years from 1979 to 2009 are indicated by a dashed line.

3 Rates are age-standardised to the Australian population at 30 June 2001.

Sources: AIHW analysis of the AIHW National Mortality Database; ABS (2010); ABS (2011).

Figure 1.4 Trends in selected leading causes of death, by sex, 1979–2009

Source: Australia's Health 2012, p. 94.

	Males		Females	
Cause of death	**Australia**	**OECD Average**	**Australia**	**OECD Average**
Coronary heart disease	98.9	117.5	52.3	60.4
Stroke	36.0	54.8	33.9	42.3
Lung cancer	39.9	51.9	19.5	19.0
Chronic respiratory diseases	4.6	4.8	3.4	2.5
Diabetes	15.1	18.4	10.4	14.1
Colon and rectum cancer	18.1	24.7	11.2	14.0
Prostate cancer	24.3	22.5		
Breast cancer			18.5	20.1
Suicide	11.9	18.2	3.3	5.1
All causes	**568.8**	**739.5**	**368.3**	**448.8**

Table 1.2 Mortality rates for Australia and the average among OECD countries, for selected causes of death, by sex, 2009 (deaths per 100 000 population)

Source: Australia's Health 2012, p. 95.

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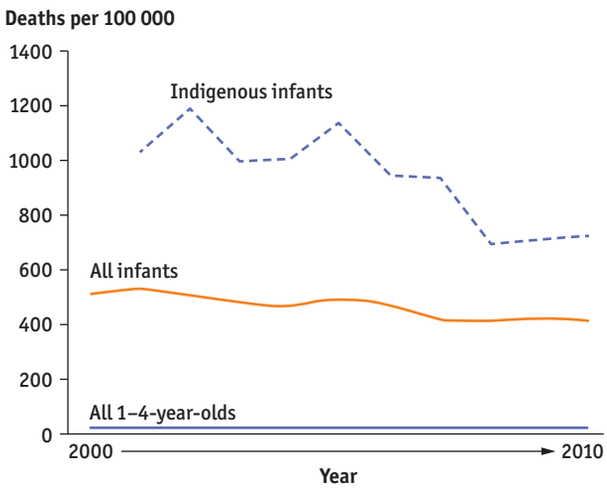
Going further 1.4

Inquire

1 From the data, identify the leading causes of death for both males and females.
2 Looking at the causes of death, how many of the top five are strongly related to lifestyle risk behaviours?
3 Investigate trends in the leading causes of death for the last 10 years. Indicate:
   - any increases
   - any decreases
   - any that have remained the same.
4 Visit the World Life Expectancy website (go to www.cambridge.edu.au/hscpdhpe1weblinks) and compare the differences between the leading causes of death in different parts of the world. In particular, examine the differences between developed and developing countries.



Sources: ABS (2011); ABS (unpublished).

Figure 1.5 Infant/young child mortality (including the gap between Indigenous and non-Indigenous people)

The number of deaths of infants (those aged under 1) divided by the number of live births, and the number of deaths of young children (those aged 1–4) divided by the population of the same age.

- Infant mortality was 413 deaths per 100 000 live births in 2010 — a fall of 21 per cent over a decade.
- Mortality rates for Indigenous infants (730 per 100 000 live births in 2010) were much higher than the overall Australian rate.
- The 2010 mortality rate for children aged 1–4 was 195 per 100 000 population — 25% lower than in 2000.

Source: Australia's Health 2012, p. 90.

Recent statistics for 2010 taken from ABS and Australian Institute of Health and Welfare (AIHW) reports indicate the following information:

- There were 143 473 deaths.
- The majority of these deaths were people aged 75 or above (65 per cent).
- Death rates for males were 1.4 times higher than for females (males 680 deaths per 100 000; females 470 deaths per 100 000).
- The leading cause of death for both males and females was coronary heart disease, followed by lung cancer for males and strokes for females.

infant mortality the number of deaths in the first year of life per 1000 live births

Infant mortality

Infant mortality is commonly viewed as an important indicator of the general health and well-being of a population, and has a large influence on life expectancy at birth. A high infant mortality rate lowers life expectancy, while a low infant mortality rate contributes to increased life expectancy. The infant mortality rate is the number of deaths in the first year of life per 1000 live births. This rate is continuing to decline in Australia: in 2001 it was 5.3 compared with 3.8 in 2011. Infant mortality rates among Indigenous Australians are also declining; however, they remain significantly higher than in the general population. Infant mortality rates for Indigenous Australians declined from 13.2 in 2001 to 7.6 in 2011 based on combined data from New South Wales, Queensland, South Australia, the Northern Territory and Western Australia.

According to the WHO, the risk of a child dying before completing their first year of age is highest in the African region (63 per 1000 live births). This is about 16 times higher than the infant mortality rate in Australia (3.8 per 1000 live births).

Global infant mortality rates have seen an improvement, with a decrease from an estimated rate of 63 deaths per 1000 live births in 1990 to 35 deaths per 1000 live births in 2012. This decline can be attributed to:

- improved education about antenatal and postnatal care
- improved support services for newborn babies and births
- improved sanitation
- improved technology
- improved diagnosis and treatment of illness
- immunisation programs.

morbidity the incidence of illness, injury and diseases that do not result in death in a specific population

Morbidity

Morbidity (sickness) refers to trends in illness, injury and disease that do not result in death in a specific population. The main morbidity measures used are

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Going further 1.5

Collaborative

Research and explain why there is such a significant difference in the infant mortality rates between Indigenous and non-Indigenous Australians.

prevalence the total number of cases of a disease in a given population at a specific point in time

health status the general pattern of health in a population over a period of time

prevalence and incidence data, which can give a much broader picture of Australia's health than mortality rates. Morbidity measures include:

- **Health surveys and reports**. One of these is the National Health Survey conducted by the ABS. It provides data on a range of health information and indicators. A limitation of health survey data is that it is often reliant on individuals self-reporting their **health status**.
- **Hospitalisation data** (number and cause of admissions to hospital). The cause of hospital admissions provides information on the patterns of serious health problems that need medical treatment (such as heart attacks). It does not accurately reflect trends in illnesses that do not require treatment and the impacts on quality of life associated with these conditions.
- **Medicare statistics**. These provide valuable data on the number of days absent from work, the reason or cause of visits to health-care providers registered with Medicare and the number of visits attended. These data do not always reflect ill-health – for example, they include visits to doctors for check-ups. Visits to some health professionals (for example, those working in private practice) for ill-health are also not accurately reflected in these data, as these visits are often not covered by Medicare.
- **Disability and handicap**. These are measures of the level of disability experienced by people as the result of a particular illness or injury.

Life expectancy

Life expectancy is a measure of how long, on average, a person is expected to live. The life expectancy of Australians has increased dramatically over the last century, and continues to increase. A boy born in 2008–10 can expect to live 79.5 years and a girl 84.0 years. For Australians born between 1901 and 1910, life expectancy was just 55 for boys and 59 for girls. Life expectancy at birth for Aboriginal and Torres Strait Islander peoples is much lower than for non-Indigenous Australians – 12 years lower for males and 10 years lower for females.

There are many contributing factors to improvements in life expectancy, including:

- improvements in medical knowledge and treatment technologies

Figure 1.6 Centrelink and Medicare office

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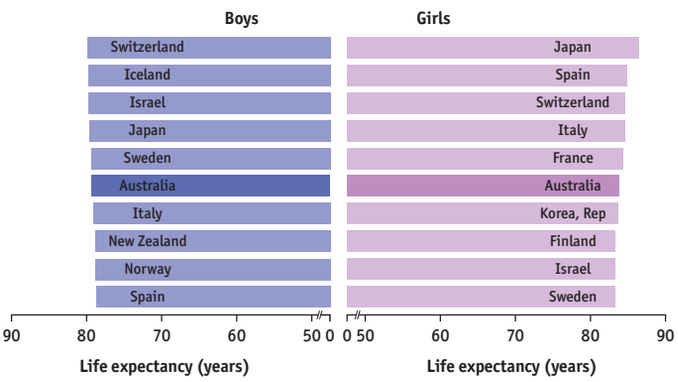
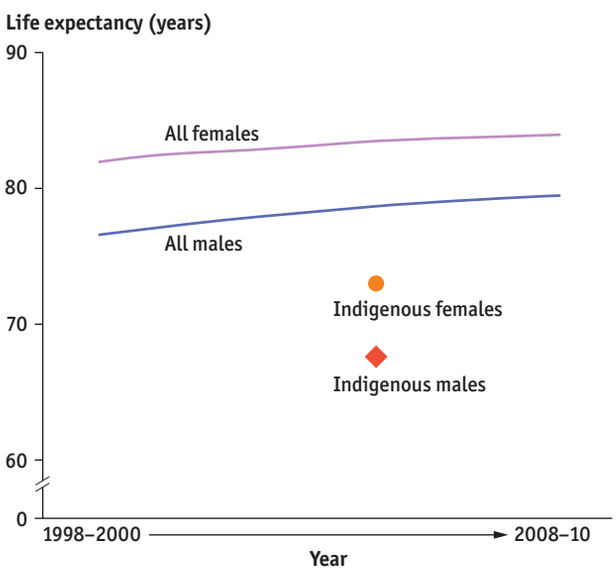


Note: Data for Australia reflect those in the OECD database and may differ to data elsewhere in this report.
Source: AIHW analysis of OECD Stat (2011).

Figure 1.7 Life expectancy at birth, top 10 OECD countries, by sex, 2009 or latest year available

Source: Australia's Health 2012, p. 122.



Source: ABS (2011).

Figure 1.8 Life expectancy (including the gap between Indigenous and non-Indigenous people)

The average number of years a person can expect to live from birth.

- Average life expectancy for girls born between 2008 and 2010 was 84.0; for boys it was 79.5.
- Male and female life expectancy continues to increase.
- Average life expectancy for Indigenous girls born between 2005 and 2007 was 72.9; for Indigenous boys it was 67.9.
- Substantial changes in the methods used to calculate Indigenous life expectancy mean that trend data are not available.

Source: Australia's Health 2012, p. 123.

- reduced smoking rates
- improvements in hygiene and sanitation
- improved working conditions and better health education.

While increasing life expectancy is an indicator of good health at a population level, it is contributing further to Australia's ageing population, which will continue to put more demands on the nation's health-care system in the future.

Figure 1.9 Many senior citizens enjoy the sport of lawn bowls

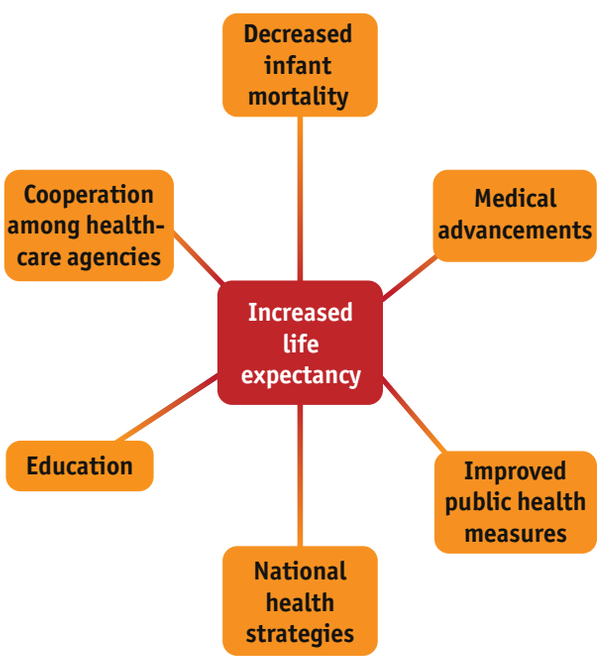


Figure 1.10 Factors influencing increased life expectancy

Summary 1.6

1 What is epidemiology?
2 What are the more common measures of epidemiology?
3 What is mortality?
4 What are the leading causes of death in Australia?
5 What is infant mortality?
6 What is morbidity?
7 What is life expectancy?
8 Outline reasons for the increase in life expectancy from the 1800s to now.
9 Analyse reasons for the difference in life expectancy between males and females. Suggest why this gap is decreasing.

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Checklist 1.7

1 What can epidemiology tell us?
2 Who uses epidemiological data?
3 Does epidemiology measure everything about health status?
4 How do we use epidemiology to improve the health status of Australians?

Use the graphs and tables in this section to answer the following questions:

5 What are the current trends in life expectancy?
6 What are the current leading causes of death for:
   - all Australians
   - males
   - females?
7 What are the leading causes of morbidity for all Australians?

Figure 1.11 The Close the Gap campaign is concerned with closing the life expectancy gap between Aboriginal and Torres Strait Islander peoples and other Australians

Identifying priority health issues

Driving question 1.8

If you had to report to the government the top five health issues for the next decade, what would you focus on in making your decision?

Despite considerable improvements in Australia's overall health over the years, there are still certain groups within the population that experience much higher rates of ill-health. Governments and health authorities need to identify and prioritise health issues based on:

- which specific groups in the community are experiencing higher rates of ill-health (health inequality)
- what constitutes the burden of the disease on individuals and the community, and what potential exists to reduce this burden.

social justice justice based on human rights – equity, diversity and supportive environments

inequality difference in outcomes

Social justice principles

Social justice is the promotion of fundamental and universal human rights and the removal of **inequality**.

With regard to the selection of health priority issues, this involves identifying areas where health inequalities exist, and providing resources and support to eliminate these inequalities. In order for health promotion to be effective at a population level, the health inequalities experienced by certain groups must be addressed using the principles of social justice.

Health inequalities are identified by comparing differences in the prevalence, **incidence**, morbidity and mortality rates among specific population groups. Recognising that some groups experience higher rates of illness and injury and lower rates of life expectancy means that a focused effort can be made to address these inequalities and ensure that these groups are provided with the opportunities to achieve their optimum level of health.

incidence the number of new cases of a disease in a population over a period of time

It is also important to consider the social justice principle of diversity, in order to recognise the many differences that exist between individuals and groups. Differences include culture, religion, age, gender, sexuality, socio-economic status, history and language. It is important not only that these differences are acknowledged, but that they direct development of health-promotion strategies and campaigns, which need to be tailored to the specific needs of the population group.

Priority population groups

Modern Australian society is very multicultural, and has many sub-groups with differing health statuses.

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Identifying the sub-groups that are experiencing an unnecessarily high incidence of ill-health enables governments to:

- determine the needs of groups in line with the principles of social justice
- gain a better understanding of the determinants of health and the impacts of socio-cultural, socio-economic and environmental influences on health
- identify and guide further epidemiological research
- plan and implement specific interventions/ campaigns to reduce the burden of ill-health in these sub-groups.

Epidemiological research highlights that there are multiple sub-groups within the Australian population experiencing higher rates of ill-health for specific health problems. They include:

- Indigenous people
- people in rural and remote areas
- socio-economically disadvantaged people
- veterans
- prisoners
- overseas-born people.

Prevalence of condition

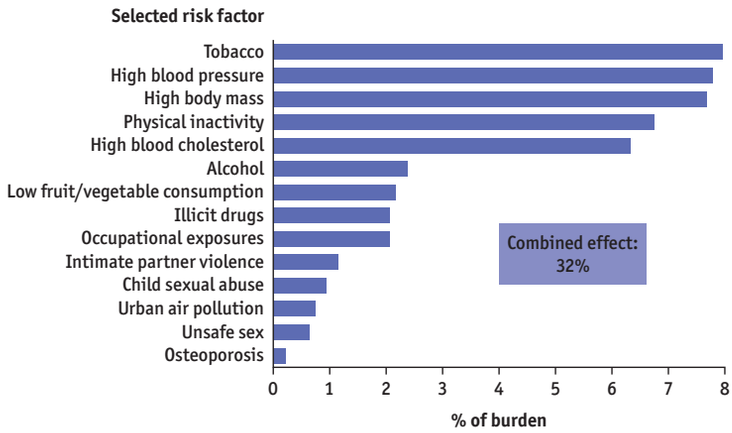
Prevalence refers to the current number of cases of an illness or condition. Epidemiological data on the number of existing cases of a particular illness in a population provides key information that can be used to identify priority health issues. Epidemiology provides information on the overall mortality and morbidity rates of Australians, as well as the causes of this mortality and morbidity. Identifying the trends can also help to determine the urgency with which conditions may need to be addressed.

Cardiovascular disease, cancer, diabetes, mental health issues, asthma and injury are major causes of mortality and morbidity in Australia, and many of these conditions are preventable:

- **Cardiovascular disease (CVD)**, although its incidence is declining, is still the leading cause of death in Australia. It currently claims over 50 000 lives per year. Approximately 2.8 million Australians (16 per cent of the population) have experienced a recent long-term CVD, with **hypertension** the most common problem.

hypertension high blood pressure

- **Cancer** is the second most common cause of death in Australia, accounting for approximately 35 000 deaths per year. The incidence of certain types of cancer is increasing, with approximately 75 000 new cases diagnosed each year. It is estimated that one in three males and one in four females will develop cancer in their lifetime.



Source: AIHW Burden of Disease Database.

Figure 1.12 Burden attributed to 14 selected risk factors, 2003

Source: Australia's Health 2012, p. 119.

- **Injury** is the leading cause of death for people aged from one to 44 years. Although injury mortality is declining, it is still responsible for 11 per cent of hospital admissions in this age group.
- The prevalence of **mental health problems** in Australia has only recently begun to be realised. It is estimated that 45 per cent of Australians will be affected by a mental health problem at some point in their lives.
- **Diabetes** is known to affect over half a million Australians. The real figure is likely to be higher, as many type 2 diabetics remain undiagnosed. It is directly responsible for approximately 10 000 deaths each year, and many more than that indirectly due to diseases that result from diabetes.
- **Asthma** is a major cause of morbidity in Australia, with levels among the highest in the world (around 11 per cent of the Australian population). Asthma especially affects young children, and is one of the most common reasons for the hospitalisation of school-age children. Despite an increase in incidence and severity, improved asthma management, diagnosis at an earlier age and an increased awareness of treatment options have resulted in a significant decrease in the number of deaths related to asthma.

Potential for prevention and early intervention

Australia has a high prevalence of chronic disease, and a significant proportion of the morbidity and mortality associated with chronic diseases could be reduced through behavioural change and establishing more supportive environments. *Australia's Health 2012* (AIHW) reports that the

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14 leading risk factors for poor health contribute to approximately 32 per cent of the disease burden in Australia.

While it appears to be a simple matter to improve health by educating and encouraging people to change their behaviours, in reality it is far more difficult due to broader environmental factors such as employment status, housing, support networks and access to health services and information. In order to significantly reduce the major causes of morbidity and mortality experienced in Australia, supportive environments need to be established that address these issues in order to encourage and support individual behaviour change.

Cardiovascular disease remains Australia's leading cause of mortality, and many of the risk factors for cardiovascular disease (hypertension, smoking, overweight, high cholesterol, sedentary lifestyles) are able to be modified. Therefore, the mortality and morbidity associated with cardiovascular disease could be reduced significantly.

Early intervention can also decrease the burden of disease substantially by maximising opportunities for effective treatment and full recovery. For example, cervical cancer is one of the most preventable and curable of all cancers. Since the National Cervical Screening Program began in 1991, mortality from cervical cancer has halved. This program targeted 20–69-year-olds and sought not only to raise awareness of cervical cancer but also to increase the number of women having regular pap smears – the most effective protective

Source: Wikipedia

Author: Planemad

Figure 1.13 DALYs or Disability Adjusted Life Years is a measure of the overall burden of disease

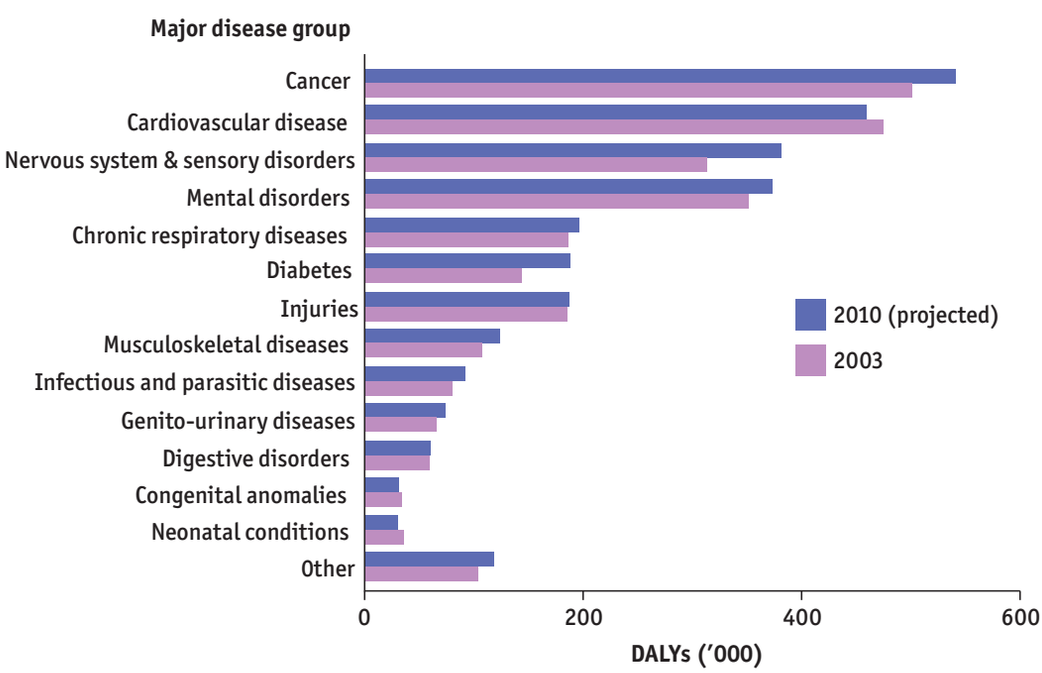

Figure 1.14 Estimated and projected total burden (DALYs) of major disease groups, 2003 and 2010

Source: Australia's Health 2012, p. 118; AIHW Burden of Disease Database.

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Going further 1.9

Inquire

1 Select two of the conditions identified and evaluate the potential for prevention and early intervention.
2 Discuss the social, environmental, economic and cultural factors that may make it difficult to change an individual's behaviours in relation to the conditions you discussed in the previous question.
3 Explain what the saying 'prevention is better than a cure' means to an individual and a community.

behaviour for cervical cancer. This program, combined with the National HPV Immunisation Strategy, has had great success in the prevention of and improved survival rates for cervical cancer.

Below are the national health priority issues for Australia:

- cancer control (first set of conditions, 1996)
- cardiovascular health (1996)
- injury prevention and control (1996)
- mental health (1996)
- diabetes mellitus (added 1997)
- asthma (1999)
- arthritis and musculoskeletal conditions (2002)
- obesity (2008)
- dementia (2012).

Costs to the individual and community

The effects of disease and injury on the community are often measured in terms of disability-adjusted life years (DALYs). This measure is used to assess and compare the fatal and non-fatal effects of disease on a population, and allows for effective comparison between diseases. The AIHW regularly uses this measure and describes one DALY as '1 year of healthy life lost due to premature death, prolonged illness or disability or a combination of these factors'. Therefore, the more DALYs, the greater the burden. Figure 1.14 is from the AIHW report *Australia's Health 2012*, and indicates the burden of disease of the major groups of disease.

There are many factors to consider when looking at the cost of ill-health to individuals and the community. The financial cost of ill-health can be split into direct and indirect costs.

- **Direct costs** are those that can be measured. They include money spent on prevention, diagnosis and treatment of those experiencing ill-health. Information on hospital admissions, length of stay in hospital, prevention strategies, cost of medical services/treatment and pharmaceutical prescriptions can be used to estimate the direct costs of ill-health in a population.
- **Indirect costs** are difficult to measure accurately, such as an individual's reduced quality of life and relationship breakdowns associated with ill-health. When individuals are diagnosed with a serious health condition, their emotional well-being is often significantly affected, and this can lead to reduced self-esteem, social isolation and depression. For individuals who experience a complete or partial loss of independence due to permanent injury, disability, long-term ill-health due to mental health problems or chronic disease, there is often a significant indirect cost to the individual's family and friends due to relationship breakdown or having to care for that individual.

Another important indirect cost to the community is the loss of productivity associated with absenteeism

Summary 1.10

1 What are the social justice principles and how do they relate to prioritising health issues?
2 What are the priority population groups in Australia?
3 Outline the prevalence of the main causes of mortality and morbidity in Australia.
4 Identify the potential for prevention and early intervention of a condition of your choice.
5 What are direct and indirect costs relating to health?

Checklist 1.11

1 How do we identify priority issues for Australia's health?
2 What role do social justice principles play in identifying priority health issues?
3 Why is it important to prioritise?

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from work due to ill-health and the costs associated with training replacement workers.

Health spending in Australia

- In 2009–10, Australia spent $121.4 billion on health, an increase of $72.2 billion compared with a decade earlier.
- Health accounted for 9.4 per cent of total spending on all goods and services in the Australian economy in 2009–10, up from 7.9 per cent a decade earlier.
- In 2008–09, Australia's average per person spending on health was $6787 for Aboriginal and Torres Strait Islander people, compared with $4876 for non-Indigenous people.
- Spending on cardiovascular diseases was higher than for any other disease, at $7.9 billion.

Source: Australia's Health 2012.

It is anticipated that there will be a significant increase in spending on health in the near future due to Australia's ageing population, further improvements in medical technology and research, increased use of Medicare and a more informed population.

Figure 1.15 Medical researcher working in a lab

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1.2 The priority areas for the improvement of health in Australia

Driving questions 1.12

1 What are some population sub-groups that you think suffer worse health than the rest of the population? With sensitivity to the complex social issues that surround this, draw some possible conclusions as to why these groups suffer worse health outcomes.
2 Considering all ages and population groups, what would be the top five health concerns affecting Australia today? What evidence are you basing this on?

Groups experiencing health inequities

Aboriginal and Torres Strait Islander peoples

The Aboriginal and Torres Strait Islander population makes up approximately 2.5 per cent of the population, yet Aboriginal and Torres Strait Islander peoples experience significantly more ill-health and higher rates of premature death than other Australians. The current data on Aboriginal and Torres Strait Islander peoples' health, although more comprehensive and accurate than ever before, still possess some limitations. This is largely due to the small population size and the

	Self-assessed status		
Selected characteristic	**Excellent/very good**	**Good**	**Fair/poor**
Proficiency in English among people who speak a language other than English in their home			
Very good	66.3	25.9	7.8
Good	45.4	36.5	18.1
Not good/not at all	45.3	32.0	22.6
Socio-economic disadvantage			
First quintile (most disadvantaged)	46.1	30.4	23.5
Fifth quintile (least disadvantaged)	63.6	25.7	10.7
Employment status			
Employed	61.9	29.0	9.1
Unemployed	44.6	41.1	19.7
Unemployed for less than one year	51.2	31.7	17.1
Unemployed for more than one year	25.4	35.7	38.9
Geographic location			
Major cities	56.5	29.1	14.4
Inner regional	55.2	28.8	16.0
Outer regional/remote	51.8	30.4	17.9
Indigenous status			
Indigenous	37.9	33.9	28.2
Non-Indigenous	56.6	28.8	14.5

Table 1.3 Self-assessed health status, by demographic and socio-economic characteristics, people aged 15 and over, 2007–08

Source: Australia's Health 2012, p. 108.

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Going further 1.13

Inquire

According to self-assessed health status, what groups appear to experience health inequity? Propose reasons for these differences in health ratings.

fact that only 33 per cent of Aboriginal and Torres Strait Islander peoples live in capital cities, which creates some difficulties for effectively gathering and analysing information about the population and specific health conditions.

The nature and extent of the health inequities

There is a great contrast in the health status of Indigenous Australians compared with their non-Indigenous counterparts. With significantly lower life expectancy and higher rates of hospitalisation, suicide and most other major illness and disease, the gap between Indigenous and non-Indigenous health is a major cause for concern.

Disparity is immediately evident when considering the age distribution of the Indigenous population. Overall, the Indigenous population is much younger than the non-Indigenous population, with a median age of 21 years compared with 36 years. This is reflective of the higher death rates (1.9 times that of the non-Indigenous population) and subsequent lower rates of life expectancy. At birth, the life expectancy of Indigenous males is 67.2 years, 11.5 years less than the 78.7 years expected for non-Indigenous males, and that of Indigenous females is 72.9 years, compared with 82.6 for non-Indigenous females.

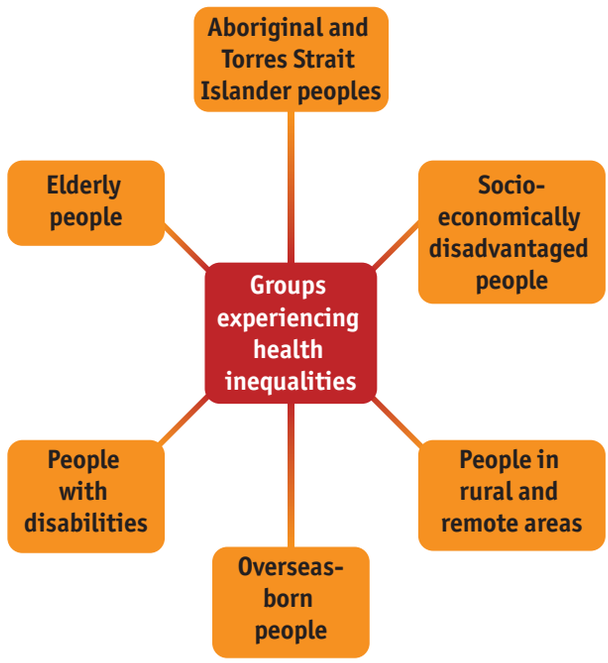
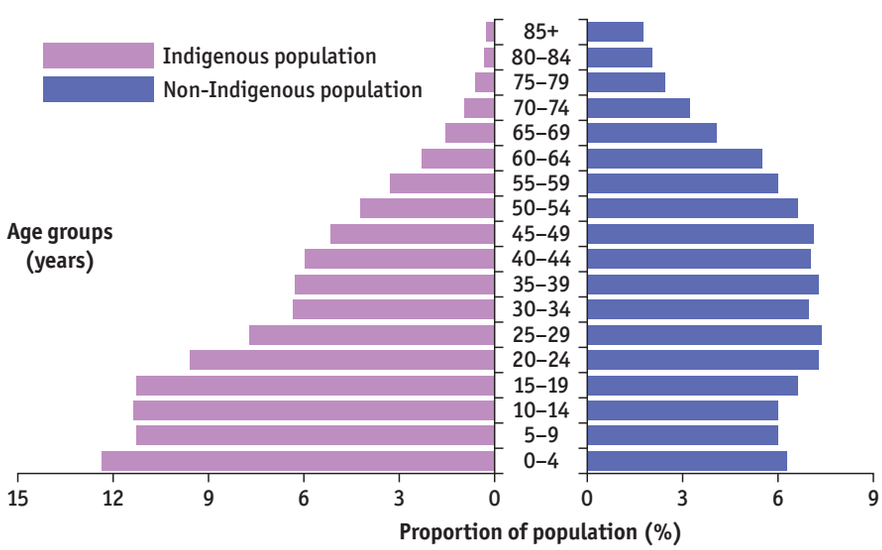


Figure 1.17 Groups experiencing health inequalities

Causes of death

Aboriginal and Torres Strait Islander peoples have a rate of avoidable death three times higher than the rest of the population. An avoidable death is classified as one that could reasonably be expected to be avoided using available health-care and prevention strategies. These avoidable



Source: ABS, 2012 (33)

Figure 1.16 Population pyramid of Indigenous and non-Indigenous populations, 2011

Source: Overview of Australian Indigenous Health Status, 2012, p. 3.

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Going further 1.14

Inquire

1 Look at the graph that compares the Indigenous and non-Indigenous population spread for 2011. What do you notice about the shape of the pyramid for Indigenous compared with non-Indigenous people? What does this tell us about the Indigenous population?
2 Approximately what percentage of Indigenous people are under 25 years of age?
3 Approximately what percentage of non-Indigenous people are under 25 years of age? How does this compare with the Indigenous pyramid?
4 Approximately what percentage of non-Indigenous people are over 60 years of age? How does this compare with the Indigenous pyramid? What does this mean?
5 Explore the population pyramids of some developing African countries, such as the Central African Republic, Congo, Chad or Zambia using the US Census International Database (see www.cambridge.edu.au/hscpdhpe1weblinks).
6 Which countries have population pyramids similar to the Indigenous pyramid of Australia?
7 Explain why the country identified may have a population pyramid similar in shape to that of Australia's Indigenous population.

Source: Questions adapted from: ABS, GeoQ 02 — comparing Indigenous and non-Indigenous population pyramids.

deaths can then be classified further as treatable or preventable. Some examples of causes of treatable and preventable deaths include some infections and forms of cancer, heart disease, type 2 diabetes, alcohol- and drug-related diseases, asthma and intentional and unintentional injuries.

In 2010, the leading causes of death for Aboriginal and Torres Strait Islander males and females were coronary heart disease and diabetes, followed by suicide for males and cerebrovascular disease for females.

Compared with non-Indigenous Australians, Aboriginal and Torres Strait Islander peoples experience higher death rates from all causes. They are:

- almost twice as likely to die from heart disease
- 6.4 times more likely to die from diabetes
- 2.7 times more likely to die from suicide
- almost five times more likely to die from cirrhosis of the liver and other liver-related disease
- three times more likely to die from respiratory disease
- 2.9 times more likely to die from infectious and parasitic diseases, and
- 2.8 times more likely to die in a land transport accident than the non-Indigenous population.

Although the infant mortality rate in the Indigenous population is still comparatively high, over the past 12 years it has been declining, with a decrease of 62 per cent since 1991.

Other health conditions

According to the National Aboriginal and Torres Strait Islander Health Survey (NATSIHS), in 2004–05 Indigenous Australians:

- were twice as likely as non-Indigenous populations to report their health as fair or poor
- had five times higher rates of hospitalisation
- were 1.6 times more likely to report asthma as a long-term health condition than non-Indigenous people

	Indigenous		Non-Indigenous			
	no.	SDR(d)	no.	SDR	Rate ratio	Rate difference
Preventable	492.5	173.1	8 802.5	54.6	3.2	118.5
Treatable	941.5	314.0	13 706.5	85.7	3.7	228.3
Avoidable	1 434.0	487.1	22 509.0	140.3	3.5	346.8

Table 1.4 Avoidable deaths, NSW, Qld, SA, WA and NT by Indigenous status, 2011

Source: ABS (see www.cambridge.edu.au/hscpdhpe1weblinks).

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- were 1.3 times more likely to suffer a heart or circulatory disease/problem
- were more than three times likely to suffer some form of diabetes
- were over 10 times more likely to suffer from kidney disease.

On a more positive note, between 2001 and 2005, rates of asthma, back pain and hearing problems in the Indigenous population decreased.

In the same survey, 71 per cent of Indigenous Australians reported being happy, or calm and peaceful (56 per cent), most or all of the time.

Socio-cultural, socio-economic and environmental determinants

Aboriginal and Torres Strait Islander peoples have experienced cultural divisions and conflicts since European settlement. There have been numerous ill-advised or ineffective programs of integration, separation, education and welfare that have contributed to the negative health status of these Australians. Although progress is being made in the area of Indigenous health and positive changes are being seen, there is still a long way to go. Programs reflecting the holistic nature of health that take into account the many contributing determinants, particularly socio-cultural elements, are proving the most effective approach.

The most critical socio-cultural, socio-economic and environmental challenges for Aboriginal and Torres Strait Islander peoples include the following:

- **Lower incomes**. Nearly half (49 per cent) of Indigenous households were in the lowest income quintile while less than 5 per cent were in the top income quintile. Median household income for Indigenous families in 2006 was equal to about 55 per cent of median household income for non-Indigenous families.
- **Higher rates of unemployment**. The unemployment rate of 16 per cent for Indigenous people in 2011 was three times the rate of unemployment for non-Indigenous people, which was 5 per cent. Aboriginal and Torres Strait Islander peoples were much more likely to be employed in blue-collar labouring jobs than non-Indigenous people (25 per cent compared with 10 per cent).
- **Lower educational attainment**. There were lower rates of school retention in all years; however, this is improving (a gap of about 30 per cent still exists between Indigenous and non-Indigenous students for Year 12 retention rates, but this has decreased from a gap of 50 per cent in 1996). There are lower rates of achievement of the minimum standards for literacy and numeracy (approximately 75 per cent in Years 3 and 7 compared with 95 per cent of non-Indigenous students). Aboriginal and Torres Strait Islander peoples who did attain a higher level of schooling rated their health as higher.
- **Lower rates of home ownership**. The proportion of Aboriginal and Torres Strait Islander families who owned or were purchasing their own homes in 2006 was half the rate of other Australian households (34 per cent compared with 69 per cent). Overcrowded living conditions were also reported by one-quarter of Aboriginal and Torres Strait Islander peoples. Rates of homelessness were four times higher for Aboriginal and Torres Strait Islander people than for non-Indigenous people – although it should be noted that some Aboriginal and Torres Strait Islander peoples choose to live in public places and do not consider themselves homeless.
- **Less access to transport**. Some 51 per cent of Indigenous households had access to a motor vehicle compared with 85 per cent of non-Indigenous households.
- **Family structure**. Aboriginal and Torres Strait Islander children were twice as likely to live in one-parent families. Being a child in a one-parent family has been linked with low SES, low educational attainment and a lack of support.

There are also other less measurable social and cultural factors that also contribute in some way to the inequities experienced by Aboriginal and Torres Strait Islander peoples. These include:

- a sense of 'loss of control of their own lives' among some Aboriginal and Torres Strait Islander peoples, which contributes further to the level of **inequity**

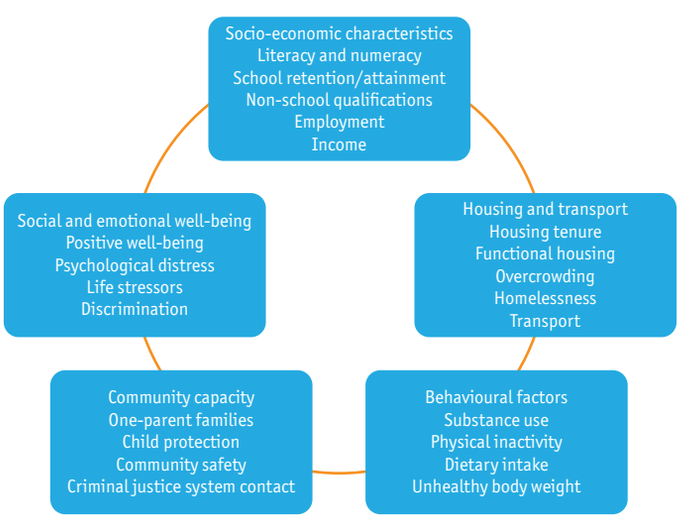

Figure 1.18 Determinants of health and well-being

Source: The health and welfare of Australia's Aboriginal and Torres Strait Islander people, p. 15.

inequity lack of fairness

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- communal approaches to family and parenting
- the remoteness of some communities
- incompatibility with many aspects of Australia's political, legal and educational systems
- a lack of Indigenous role models in some areas of society.

It is difficult to measure precisely the relationship between these social determinants, multiple risk factors and health status. However, the 2008 AIHW *Report on Aboriginal health and welfare* emphasises that the underlying social determinants mentioned, clearly increase the likelihood of exposure to a number of the following health risk factors:

- tobacco use
- alcohol consumption
- illicit drug use
- overweight and obesity
- poor nutrition
- physical inactivity
- exposure to violence
- poor housing conditions.

The roles of individuals, communities and governments in addressing the health inequities

In order to improve the health of Aboriginal and Torres Strait Islander peoples in the most effective way, a collaborative and considered approach is needed.

Close the Gap is a key campaign addressing Indigenous health inequities. Endorsed in 2008 by the Australian government, the Australian Human Rights Commission and Indigenous health organisations with the signing of a statement of intent, the strategy aims to reduce Indigenous disadvantage in life expectancy, child mortality, education and employment by 2030.

One of the most significant elements of the statement was a commitment to involve Aboriginal and Torres Strait Islander peoples and their representative bodies in all aspects of the strategy – for the government at all levels to partner with Aboriginal and Torres Strait Islander people and communities, to build on their ideas, strengths and leadership in order to find sustainable solutions to long-standing problems. Community-based approaches to health that involve the Indigenous community at all levels are the key to the success of the strategy, as they empower Aboriginal and Torres Strait Islander people and ensure the delivery of culturally appropriate programs.

One key element of the strategy is the National Partnership Agreements between the Commonwealth government, and state and territory governments. Each of the six agreements focuses on a different Indigenous issue:

- Indigenous early childhood development
- remote service delivery
- Indigenous economic participation
- remote Indigenous housing
- Indigenous health outcomes, and
- remote Indigenous public internet access.

These agreements involve significant funding from the Commonwealth government to Indigenous community and health organisations to specifically target each of the issues. Within each of these agreements are partnerships between the state governments and the local Aboriginal and Torres Strait Islander communities in each state.

At the core of all strategies are education and access, with the aim of empowerment.

Going further 1.15

Inquire

1 **Read the preamble to the Close the Gap campaign on the Australian Human Rights Commission website (see www.cambridge.edu.au/hscpdhpe1weblinks).**
2 **In the preamble to the Close the Gap statement of intent, one of the major aims is to decrease the gap in literacy, numeracy and employment opportunities. Explain how improvements in these areas could in turn lead to improvements in all areas of health for Aboriginal and Torres Strait Islander peoples.**

Examples of campaigns targeting Indigenous health

- Aboriginal Healthy Lifestyle program (see www.cambridge.edu.au/hscpdhpe1weblinks)
- Yiriman Project (see www.cambridge.edu.au/hscpdhpe1weblinks)

Indigenous versions of national health-promotion campaigns

Indigenous versions of national health-promotion campaigns have been rolled out in communities with a high Aboriginal and Torres Strait Islander population. Have a look at some of the campaign materials:

- ***Aboriginal and Torres Strait Islander guide to healthy eating*** (see www.cambridge.edu.au/hscpdhpe1weblinks). The *Aboriginal and*

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Going further 1.16

Inquire

Go to the Yiriman Project website (see www.cambridge.edu.au/hscpdhpe1weblinks).

1 What are the main aspects of the health inequities that the Yiriman Project is aiming to address?
2 How is the project doing this?
3 What are some of the characteristics of the program that make it so successful?

Going further 1.17

Collaborate

In small groups, discuss the importance of adapting promotion materials to make them more appropriate for Indigenous communities. In what ways are the ads different from the national campaign material?

Torres Strait Islander guide to healthy eating was developed with a number of other campaign resources, including cooking shows and a step-by-step cookbook of simple, healthy meals that aim to encourage Indigenous Australians to adopt and follow a healthy, balanced diet. It aims to empower Indigenous Australians to make positive choices about their food.

- **'Tomorrow People'** (see www.cambridge.edu.au/hscpdhpe1weblinks). The 'Tomorrow People' campaign is the Indigenous version of the national 'Measure Up' campaign. The campaign uses well-known Indigenous Australians like Olympic basketballer Rohanee Cox to promote healthy lifestyle behaviours such as being physically active and eating a nutritious diet.

Socio-economically disadvantaged people

Socio-economic status (SES) is most commonly measured in terms of a person's level of income, education and employment. Someone who is considered to be socio-economically disadvantaged generally experiences a low level of income, participates in lower paying, unskilled employment, has lower levels of educational attainment and lives in poor-quality housing.

Studies have shown that these factors play a significant role in determining an individual's level of health, and identify low socio-economic status as a risk factor for poor health. In general, relatively disadvantaged people have higher rates of illness, disability and death compared with those who are more advantaged in society. Furthermore, it seems that there is a linear relationship between SES and health, with health status decreasing as SES decreases.

Socio-economically disadvantaged people in Australia experience:

- lower life expectancy
- a higher burden of disease
- higher rates of depression, type 2 diabetes, chronic respiratory disease and cardiovascular disease.

A large proportion of the disease and illness experienced by low SES groups can be attributed to lifestyle choices. Lifestyle risk factors such as smoking, a sedentary lifestyle, overweight and obesity, and high-fat and high-salt diets become more common as SES declines. For example, rates of smoking are twice as high among the most disadvantaged than among the least disadvantaged.

The Australian government has many strategies and policies in place to address the health inequities of disadvantaged Australians. Medicare is an initiative of the Commonwealth, and provides affordable health care for all Australians. In the past, this has included free treatment as a public patient in a public hospital, and free or subsidised treatment by practitioners such as doctors, including specialists, participating optometrists and dentists. This is further supported by the Pharmaceutical Benefits Scheme (PBS), which subsidises some prescription medications to make them more affordable. However, this is due to change following the announcement of the 2014 federal budget, which would see patients being charged for treatment in public hospital emergency departments, and new fees to visit their GP.

People in rural and remote areas

Nature and extent of health inequities

Some 29 per cent of the Australian population lives in rural areas and a further 3 per cent live in areas classified as remote. Rural areas are areas outside of metropolitan areas that have lower populations and are further from major cities, and remote areas are significantly removed from major service centres.

People living in rural and remote areas generally experience a range of health inequities due to their geographical isolation. Many experience

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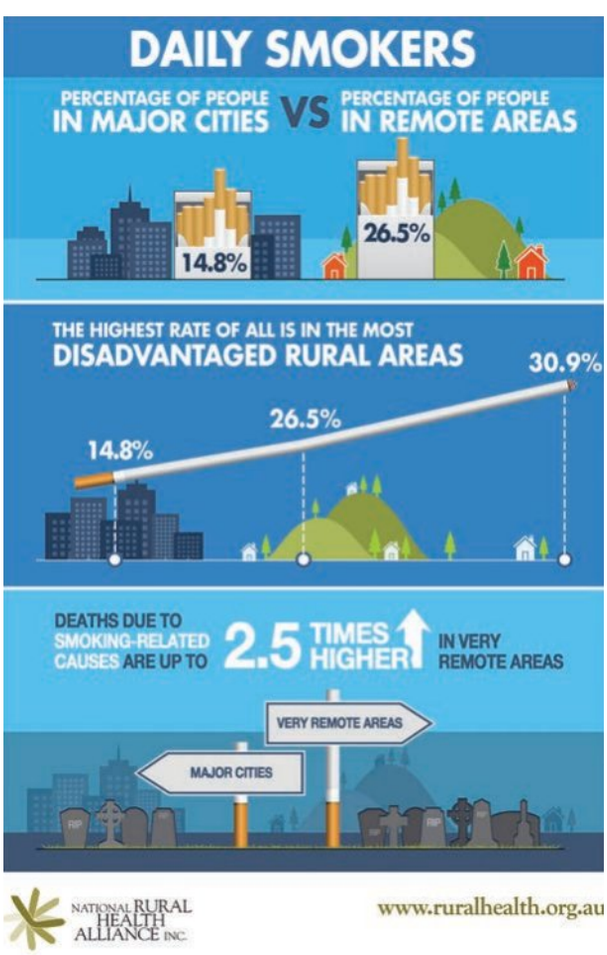
limited access to goods and services, and fewer educational and employment opportunities. The *Rural, regional and remote health report* identified the following:

- Death rates in inner/outer regional areas were about 10 per cent higher than those in major cities.
- Death rates in remote and very remote areas were between 20 and 70 per cent higher than those in major cities.

Compared with city dwellers, people in rural and remote areas:

- experience similar levels of diabetes, cerebrovascular disease (stroke), coronary heart disease, depression and anxiety
- experience slightly higher levels of cancer in rural areas, but lower levels of cancer in remote areas
- are more likely to suffer acute or chronic injury
- experience lower life expectancy, increasing with remoteness
- are less likely to report very good or excellent health
- are more likely to show high to very high levels of psychological distress among males.



Source: Rural Health (see www.cambridge.edu.au/hscpdhpe1weblinks)

Figure 1.19 National Rural Health Alliance smoking infographic

Socio-cultural, socio-economic and environmental determinants

A range of factors contribute to the lower levels of health experienced by people living outside major cities.

Access to affordable and comprehensive health services can prevent illness in the first place, slow the development of illness or chronic conditions, and provide timely emergency care. The long distances between population centres and sparse population distribution can result in problems in providing adequate health services and difficulty in accessing them.

In rural and remote communities, there are also fewer educational and employment opportunities available. This may contribute not only to a lower socio-economic status and income, but also to a feeling of loss of control. Studies have shown that stress related to lower levels of control over an individual's life is associated with substantially poorer health and higher death rates. Many people in some smaller and isolated communities have lower levels of access to real jobs and greater reliance on social security, and so have limited control over their lives, leading to higher levels of stress and the resultant health consequences (see Rural Health Alliance fact sheet 28 at www.cambridge.edu.au/hscpdhpe1weblinks).

The nature of employment in rural and remote areas means that there is greater exposure to risks through occupation. This may contribute to the higher rates of acute and chronic injury.

The link between health status and income is recognised globally. In Australia, incomes of those in rural areas are on average 20 per cent lower than the incomes of those living in major cities, which can limit such aspects of life as food choices and health-care options. Those who are involved in farming are reliant on the natural environment for their income. Poor seasons can affect the farmer's income and place great emotional stress on them and their family, which can lead to harmful behaviours like risky drinking or suicide.

It has also been suggested that limited social venues in rural areas are an underlying factor in the higher rates of risky drinking in rural and remote areas. Local pubs and sports clubs are among the few social venues available in many rural areas, which encourages socialisation with alcohol to take place.

There is a significant parallel between Aboriginal and Torres Strait Islander peoples health and the health status of those living in rural and remote areas, as almost one-quarter of people living in rural and remote areas are Indigenous.

Negative lifestyle behaviours can also contribute to poor health. People living in rural and remote

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areas have been reported to display higher levels of risk behaviours that may contribute to lower levels of health. They are more likely to:

- smoke
- drink alcohol in risky quantities that would be harmful in the short term
- be overweight or obese
- consume less low-fat or skim milk or to eat under the recommended two serves of fruit per day
- consume fewer than four or more serves of vegetables per day
- experience lower birth weights, particularly among teenage mothers.

Roles of individuals, communities and governments in addressing the health inequities

Rural communities experience great difficulty in sustaining adequate health and medical services for their members. A large proportion of these issues arise from difficulties attracting and retaining staff.

For this reason, many of the health-care facilities in rural and remote areas are multi-purpose. This allows communities to target the services to the specific needs of their community, integrate services, reduce running costs and staffing needs, and share resources.

The National Rural and Remote Health Program works with communities and health professionals to improve health services in rural areas. The program focuses on educating health practitioners about the specific needs of rural communities, and training remote health workers to be able to adequately address those needs. Another facet of the program focuses on providing psychological support to those in the rural health workforce and their families, to manage the stress associated with rural, remote and very remote practice, including financial incentives to encourage doctors to make the move to a rural area.

Going further 1.18

Inquire

1. Research the RFDS by going to its website (see www.cambridge.edu.au/hscpdhpe1weblinks).
2. What sort of unique support does the RFDS provide for rural and remote Australians?
3. From what sources does the RFDS receive its support and funding?

Within New South Wales, the government has established a rural health plan, which details the major issues experienced by rural and remote communities and seeks to develop innovative strategies to address these issues. The New South Wales government has ongoing consultation with rural health practitioners and communities in the development of these strategies to develop local solutions to local problems. Funding support is also provided to NGOs and community health services through this plan.

Working closely with communities and health practitioners, some of the initiatives include:

- **Health Direct Australia**. This is a telephone triage and advice line staffed by registered nurses to provide health information and advice 24 hours a day, seven days a week, every day of the year.
- **Patient-Assisted Travel Schemes**. Financial assistance is available for transport and accommodation costs for those who have to travel over 100 kilometres to access specialist medical care.
- **Mental Health Services in Rural and Remote Areas (MHSRRA) program**. This program provides funding to non-government health organisations such as the Royal Flying Doctor Service (RFDS) and Aboriginal Medical Service to support them in the provision of mental health services.
- **Mobile Dental Service.** Aimed at improving oral health in the Aboriginal and Torres Strait Islander population, this service involves the use of mobile dental facilities, including vans, 4WD vehicles and portable equipment, to deliver dental care to regional and remote Aboriginal and Torres Strait Islander communities.

Overseas-born people

The Australian population consists of a diverse mix of cultures, religions and ethnicities, with over one-quarter of our population born overseas. The health status of those people born overseas varies quite significantly, based on the circumstances in which they have come to Australia and the length of time they have lived in this country.

In general, the health of immigrants arriving in Australia is very good – in many cases, better than the health of the general Australian population. Immigrants settling in Australia do so through the Migration Program, and generally have lower rates of disability and disease risk factors, lower rates of hospitalisations and lower death rates. This can largely be attributed to the strict health screening processes and selective criteria for migration.

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However, as time progresses, the health status of overseas-born people tends to decrease. The AIHW reports that overseas-born people are more likely to smoke, be overweight or obese, eat less fruit and be less active than Australian-born people.

Some reasons for the decrease in health status are:

- barriers to accessing health services, such as poor English and a lack of services in a person's native tongue
- poor understanding of the Australian health-care system
- low socio-economic status – which can be due to limited employment opportunities due to language barriers or unrecognised qualifications
- distrust of health professionals due to previous abuse (predominantly with refugees)
- stress and anxiety due to resettlement and adjustment to a new culture
- influences of Western culture and increased availability of fast foods
- discrimination and racism.

In addition to the Migration Program, a small proportion of overseas-born people settle in Australia as part of the Humanitarian Program, which grants permanent visas to 13 500 refugees each year. Refugees are people who have been granted residency in Australia after fleeing their home countries due to fear of persecution, war or violence.

Refugees who have settled in Australia may have very different health issues compared with other overseas-born Australians. They are more likely to experience anxiety, depression and post-traumatic stress disorder (PTSD), physical injury from past torture or violence, poor dental health, and growth and development issues due to their traumatic background. People asking for asylum in Australia, known as **asylum seekers**, can also face detention for an unrestricted amount of time while their claims are processed. Living in detention can have a severe effect on mental health in particular.

asylum seeker the name given to a person who is seeking protection as a refugee and is still waiting to have a claim assessed

The Refugee Council of Australia seeks to support refugees as they settle in Australia, by providing them with services, education and skills to help them establish a life in Australia.

As the health, language and cultural needs of communities within Australia are so diverse, it is more effective for health issues to be addressed at a community level. Local governments and councils have a good understanding of the needs of their communities, and can address local issues more appropriately. This can include the provision of multi-lingual services, English classes, multicultural events and health services that are culturally sensitive, such as women-only health centres.

These councils also often work in partnership with state governments and other non-government organisations (NGOs) and community organisations to deliver programs. For example, the New South Wales Refugee Health Service works with communities identified as having high refugee populations to deliver programs that address specific needs – for example, the Fairfield Nutrition project, which seeks to address nutrition and food security issues among refugee children and their families in the Fairfield local government area in Sydney.

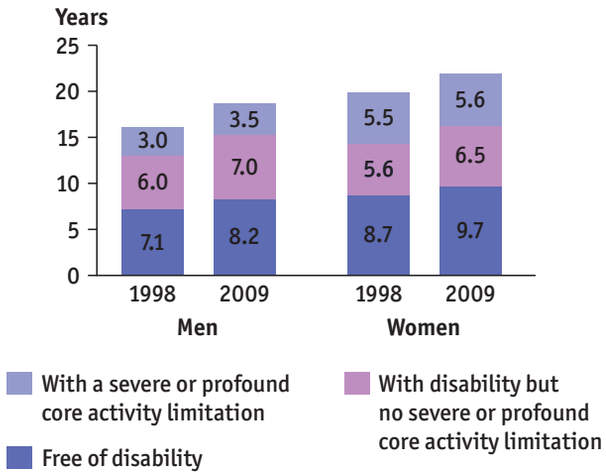

Figure 1.20 Expected years of life at age 65, 1998 and 2009

Elderly people

Australia has an ageing population. The proportion of older Australians (65 years or older) in the population has almost doubled since the 1970s, and this is a trend that will only grow. As people age, the likelihood of them developing a chronic disease or experiencing some level of disability increases. The most frequently reported health conditions for older Australians are long-sightedness, deafness and hypertension, and the leading causes of death are heart disease, stroke and cancer. Dementia is another condition that affects a significant proportion of older people. Dementia rates in terms of both mortality and morbidity have increased over the past 10 years, and it is expected that they will continue to rise.

Despite older people in general experiencing higher rates of disease and disability than the younger population, many older Australians are healthy and content with life, actively participating in Australian society and maintaining relationships with family and friends. The physical health of

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Checklist 1.19

1 For Aboriginal and Torres Strait Islander peoples, research and analyse:
   a the nature and extent of health inequities
   b socio-cultural, socio-economic and environmental determinants
   c the roles of individuals, communities and governments in addressing the health inequities.
2 For one other group, research and analyse:
   a the nature and extent of health inequities
   b socio-cultural, socio-economic and environmental determinants
   c the roles of individuals, communities and governments in addressing the health inequities.

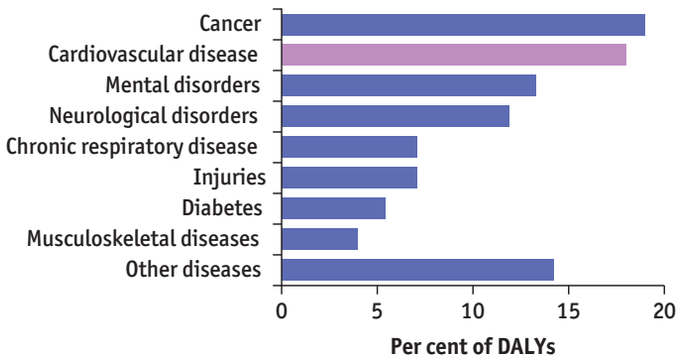
older Australians has also shown some positive trends, with more people living for more years free of disability.

People with disabilities

Disability can be measured along a continuum, and affects people to varying degrees. There were approximately four million people (18.5 per cent of the population) living with a disability in 2009. Of these, 32 per cent experienced severe limitations in self-care, mobility or communication, while 61 per cent were under the age of 65.

People with a disability experience a range of challenges in achieving the same health status as the rest of the population, and consequently experience lower levels of health. Data from 2009 found that people with a disability had higher rates of asthma, cancer, CVD diabetes, arthritis, osteoporosis and injuries. In addition, the likelihood of people with a disability having more than one of these conditions was significantly higher than for the rest of the population, and increased with the severity of the disability.

Levels of distress, anxiety and mood disorders were also found to be higher in people with a disability. Once again, as the severity of disability increased, so did the likelihood of these issues. Another finding of the study was that there were higher rates of risk factors such as smoking, obesity and risky alcohol consumption, which contributed to the aforementioned health issues.



Source: AIHW, *Burden of diseases and injury*, 2007.

Figure 1.21 The burden of disease (% of DALYs) by broad disease groups in Australia, 2003

Source: Australian Institute of Health and Welfare.

People with a disability receive care and assistance from a range of sources, including both government and non-government organisations, as well as family and friends:

- **Unpaid carers**. In 2003, 20 per cent of primary carers (the person who provides the most assistance in self-care, mobility and communication) were unpaid carers, including family and friends.
- **Income support programs**. These include the Disability Support Pension or the Carer Allowance.
- **Home and Community Care**. This program seeks to increase independence and decrease rates of people needing residential care.
- **Mainstream services**. These include health services, transport services and employment services that people with a disability may access.

High levels of preventable chronic disease, injury and mental health problems

Figure 1.21 shows the health issues that have been identified as national health priority issues in Australia, and the extent to which they contribute to DALYs and the burden of disease. A significant portion of these diseases are preventable and the result of poor lifestyle choices. By identifying these issues, the risk and protective behaviours that are associated with them, the groups at risk and the determinants that influence the development of these conditions, a strategic and comprehensive effort can be made to reduce the burden these conditions place on individuals and the community.

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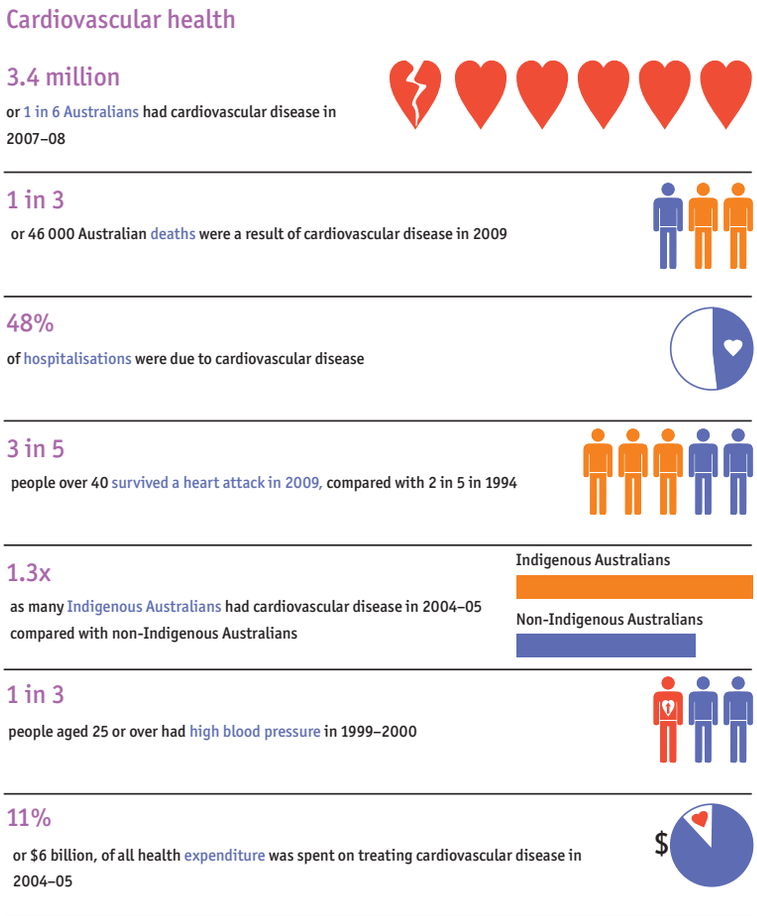

Figure 1.22 Cardiovascular health statistics in Australia
Source: Australian Institute of Health and Welfare.

The results of the 2007–08 National Health Survey indicate a high prevalence of chronic diseases among Australians, including:

- cancer (2 per cent of the population – up from 1.6 per cent in 2001)
- diabetes (4 per cent – up from 2.9 per cent in 2001)
- asthma (10 per cent – down from 12 per cent in 2001)
- long-term mental or behavioural conditions (11 per cent – up from less than 10 per cent in 2001)
- arthritis (15 per cent – up from 14 per cent in 2001)
- conditions of the circulatory system (16 per cent – down from 17 per cent in 2001).

Cardiovascular disease

The nature of CVD

Cardiovascular disease (CVD) is a broad term used to describe all conditions and diseases of the heart and blood vessels. There are three main types of CVD in Australia:

- **Coronary heart disease** (also called ischaemic heart disease). This is the most common type of CVD. It takes two main forms:
  - **angina** – a temporary loss of blood supply to the heart, which results in periodic chest pain. Angina is not life-threatening and can generally be controlled with medication.
  - **heart attack** – results from a sudden blockage to the heart's blood supply, which causes damage to the heart and its function.
- **Stroke**. A stroke occurs when there is a blockage in the vessels that supply blood to the brain or those vessels rupture and begin to bleed.
- **Peripheral vascular disease**. This occurs when the arteries that supply blood to the peripheries (e.g. the legs and arms) are

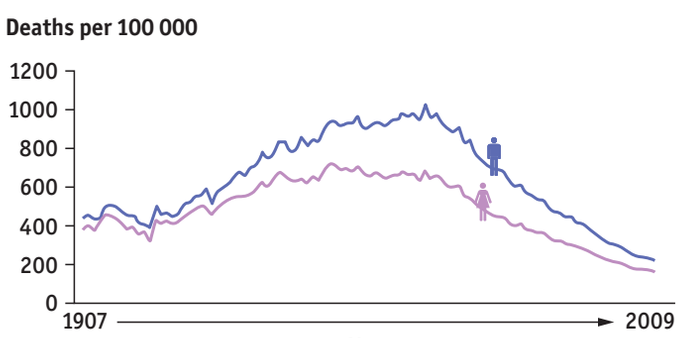

Figure 1.23 Trends in cardiovascular deaths

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obstructed. In severe cases, this can lead to gangrene and amputation.

Other forms of CVD include heart failure, cardiomyopathy, arrhythmia, acute rheumatic fever, rheumatic heart disease and congenital heart disease. In the majority of CVDs, the main underlying cause is **atherosclerosis**.

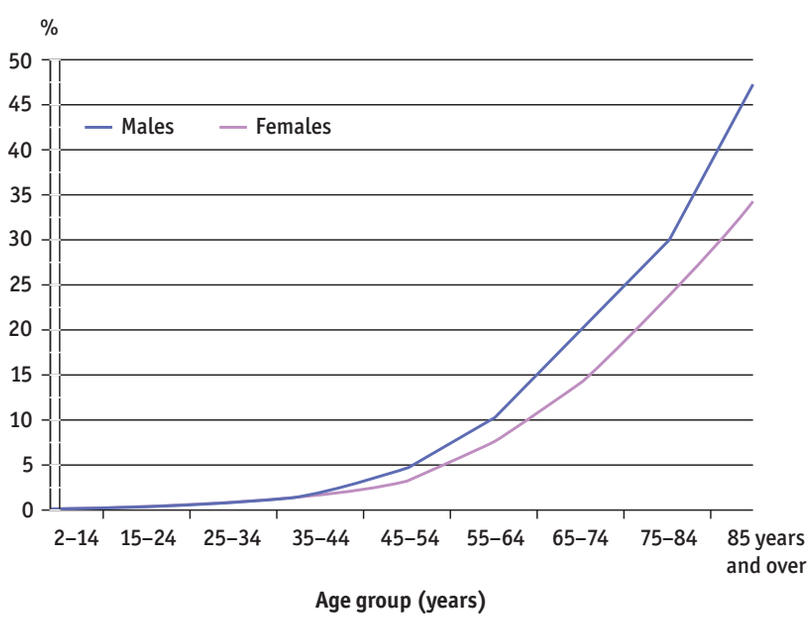
atherosclerosis a condition where plaque forms on the inside of arteries

The name atherosclerosis comes from the Greek words *athero* (meaning gruel or paste) and *sclerosis* (hardness). Atherosclerosis is the build-up of fatty and fibre-like deposits on the inside walls of the arteries. This build-up is referred to as plaque, and results in the wall of the artery becoming harder and less elastic (arteriosclerosis). As the plaque continues to thicken the walls of the artery, the diameter of the blood vessel decreases, resulting in an increase in blood pressure. These build-ups of plaque take place progressively over a long period of time, and can occur in any artery in the body, but are most dangerous when they are located in the arteries that supply the heart, brain or legs. A blockage of the artery can occur if a piece of the plaque breaks off or a blood clot forms, resulting in a stroke, heart attack, gangrene or other condition.

Extent of and trends in CVD

CVD has been the leading cause of death for the past 10 years and, despite a 78 per cent decrease in the death rate since 1968, it remains the front runner. Although there are many areas where progress is being made in cardiovascular disease, there is still a lot of room for improvement.

- As a group, CVDs cause around 30 per cent of all deaths nationally.
- In 2011, the leading underlying cause of death for all Australians was coronary heart disease, which includes angina, blocked arteries of the heart and heart attacks. It accounted for 14.6 per cent of all deaths.
- Cerebrovascular diseases were the second leading underlying cause of death in 2011. Cerebrovascular diseases include haemorrhages, strokes, infarctions and blocked arteries of the brain. Over the last 10 years, deaths due to this cause have decreased by 10.2 per cent, from 12 533 deaths in 2002 to 11 251 deaths in 2011.
- In 2011–12, 5 per cent of the population (aged 2 and over) had some form of heart disease.
- The proportion of people with heart disease increased with age, with more than 25 per cent of all Australians over the age of 75 suffering from CVD.
- The highest rate of CVD (47.1 per cent) was in men aged 85 years and over.
- Survival rates for heart attacks are increasing for both males and females, but males are twice as likely to have a heart attack.
- In general, heart disease was more common among men (5.5 per cent) than women (4.5 per cent).



Notes: (a) Includes heart attack and other ischaemic heart diseases, stroke and other cerebrovascular diseases, oedema, heart failure and diseases of the arteries, arterioles and capillaries.
Source: Australian Health Survey: Updated results, 2011–12

Figure 1.24 Persons aged 2 years and over – proportion with heart diseases (a), 2011–12

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- The proportion of people with heart disease increased as the level of disadvantage increased. People living in areas of most disadvantage were more likely to have heart disease compared with those living in areas of least disadvantage (6.5 per cent compared with 3.3 per cent).

Risk factors and protective factors for CVD

Risk factors that contribute to the development of CVD can be modifiable or non-modifiable.

Non-modifiable risk factors include the following:

- **Age**. The risk of CVD increases with age, due to the ageing of the heart muscle. The reducing efficiency of the heart may compound problems associated with CVD and decrease the effectiveness of treatments.
- **Family history**. People with a family history of CVD, especially a first-degree blood relative, tend to be more likely to develop CVD.
- **Gender**. Men are more at risk of developing CVD than pre-menopausal women. Once women go through menopause, their risk is similar to men's. This is thought to be due to the protective nature of oestrogen and the fact that there is a decrease in oestrogen levels once past menopause.

There are many risk factors for CVD that are related to lifestyle choices, and can be modified or managed. They include:

- **High blood pressure (hypertension)**. As blood pressure increases, so does the risk of heart attack, stroke and heart failure. This is due to the increased stress placed on the heart and blood vessels, and the contribution it makes to the process of atherosclerosis. Hypertension is the leading cause of CVD worldwide.
- **Smoking**. Smoking is thought to be responsible for approximately 10 per cent of all CVDs, and doubles the chance of a heart attack or a stroke. This is due to the contribution of smoking to the increased rate of atherosclerosis.
- **Obesity and overweight**. As well as directly increasing the risk of CVD, being overweight or obese can contribute to other risk factors such as high blood pressure, high blood cholesterol and diabetes.
- **Physical inactivity**. Physical inactivity is often linked with other risk factors such as high weight and poor diet, which are also risk factors for CVD.
- **High blood lipid (fat) levels**. Higher levels of blood cholesterol and triglycerides mean a higher risk of heart disease and stroke, due to the increased risk of atherosclerosis.
- **High waist-to-hip ratio**. A waist-to-hip ratio of 1 for men and 0.9 for women is a sign of obesity and high intra-abdominal fat. This can affect blood pressure and blood lipid level, and interferes with the body's ability to use insulin.
- **Nutrition**. A diet high in saturated fat and salt can contribute to higher rates of CVD. High salt intake is linked to hypertension (another risk factor for CVD) and a diet high in saturated fats is linked to high blood lipid levels.
- **High alcohol intake**. Any more than two drinks a day can damage the heart muscle.

Related conditions

- **Diabetes**. A condition that affects the ability of the body's cells to take up and use glucose. People with CVD frequently have type 2 diabetes. Diabetes increases the risk of developing CVD.
- **Kidney disease**. Kidney dysfunction greatly increases the risk of developing CVD, as the kidneys play a central role in regulating blood pressure and balancing important electrolytes that maintain the heart's rhythm.

CVD is a largely preventable disease, and there are numerous things that a person can do to greatly reduce the risk. They include:

- regular physical activity
- avoiding smoking or exposure to tobacco smoke
- good nutrition that includes a diet low in saturated fat and salt, and high in fruits and vegetables
- maintaining a healthy weight
- managing stress in positive ways
- low consumption of alcohol
- regular check-ups, including monitoring of cholesterol levels and blood pressure.

Socio-cultural, socio-economic and environmental determinants of CVD

The social and physical environment in which a person lives can contribute to the likelihood of developing CVD.

There is a well-documented and direct link between SES and CVD. Recent statistics from the ABS show that as the level of SES decreases, the rate of CVD increases. This is largely due to the increased risk behaviours of people of low SES. Higher rates of smoking, obesity and physical inactivity all contribute to the development of CVD, and are present in somewhat higher levels among people with low SES. Factors such as a lower level of education are also linked to higher rates of CVD, as less education is linked to poor health choices and diminished knowledge about health services.

The social and cultural environment in which someone lives can also influence the likelihood

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of developing CVD. Aboriginal and Torres Strait Islander peoples have higher rates of CVD than the rest of the population and generally have a lower SES and lower levels of education. High-risk behaviours such as excessive drinking and smoking are also statistically higher among Aboriginal and Torres Strait Islander peoples. In contrast, Asian population groups have been shown to have lower levels of CVD.

Community support for protective behaviours can have a positive impact on the likelihood of developing CVD. For example, media campaigns about the harmful effect of smoking, restrictions on where people can smoke and general negative attitudes towards smoking have led to a decrease in rates of smoking, which is a significant contributor to the development of CVD. Individual attitudes towards physical activity, nutrition and other health behaviours can have a large impact on the risk of developing CVD.

Geographical location has also been found to impact the risk of developing CVD. People living in rural and remote areas have higher rates of CVD than those living in metropolitan areas. A large reason for this is the lack of access to health information, services and technology. People in rural and remote areas also tend to have higher rates of smoking and excessive drinking.

Groups at risk of developing CVD

The groups that are most at risk of developing CVD include:

- tobacco smokers
- people with a family history of CVD – especially those with a first-degree relative who has CVD
- people with hypertension
- people with high blood lipids
- males
- people who are sedentary
- Aboriginal and Torres Strait Islander people, low SES groups and those living in rural and remote areas – largely because they exhibit higher rates of smoking, excessive drinking and lower levels of education and access to health services.

Cancer (skin, breast and lung)

The nature of cancer

Cancer refers to a group of diseases that result from the uncontrolled growth of body cells. Every person has trillions of cells; these cells are what allow us to live and function. Normally, cells grow and multiply in a controlled way, but sometimes something goes wrong within a cell and it mutates. This damaged cell, now out of control, continues to multiply, creating more and more mutated cells.

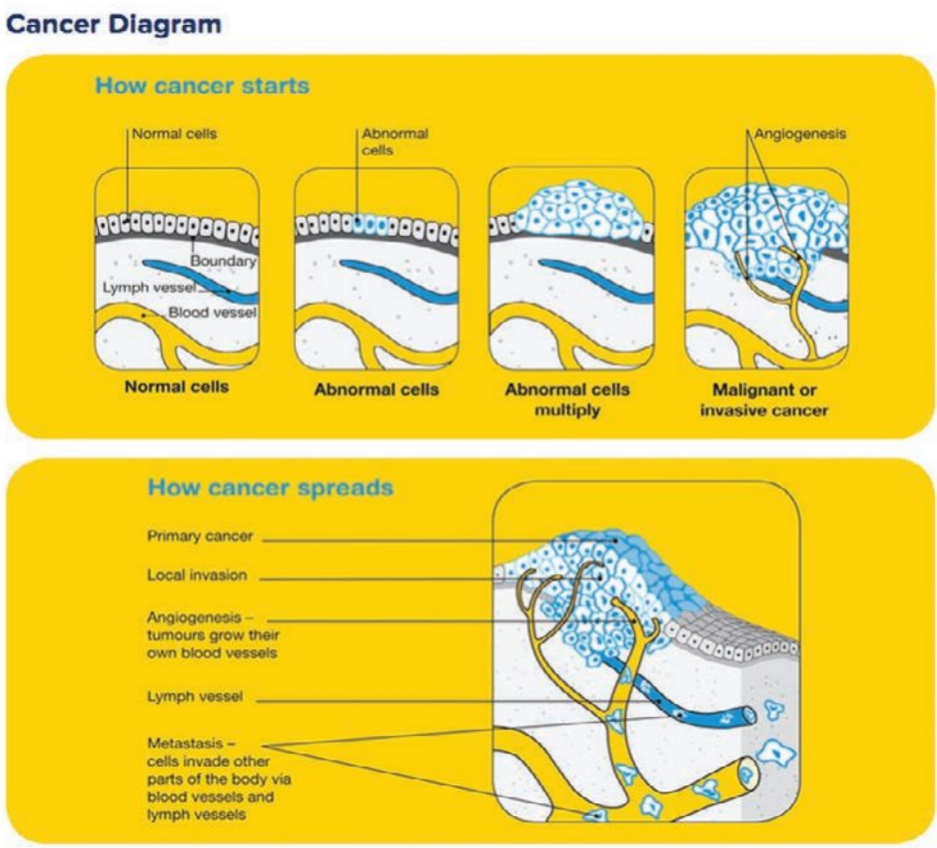

Figure 1.25 How cancer starts; how cancer spreads

Source: Information sourced from Cancer Council Australia, www.cancer.org.au

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These masses of cells are called tumours.

There are two different types of tumours. A **benign** tumour forms and remains local to the area in which it formed. These tumours can generally be removed surgically and do not pose a threat. However, if the tumour has the potential to spread uncontrolled throughout the surrounding normal cells and affect their functioning, it is called **malignant**. If left untreated, these cancer cells can break off and enter the bloodstream, then travel to other parts of the body. This is known as a **metastasis**, and results in what is called secondary cancer.

benign a tumour that is not considered harmful

malignant a tumour that has spread, or has the ability to spread, throughout the body

metastasis a secondary malignant growth

Cancers can develop from most cell types, and are classified according to the area of the body where they initially began and/or the type of cell involved. For example, cancer that begins in the lung is known as lung cancer, and cancer that began in the breast is known as breast cancer regardless of whether it has spread to other parts of the body. The different cell types of cancer are:

- **carcinomas** – cancers that develop in the skin or the cells that line or cover internal organs
- **sarcomas** – these begin in connective tissue and supportive tissues such as bone, muscle and cartilage
- **hematopoietic** – cancers that begin in blood-forming tissue such as bone marrow. These cancers do not form tumours, but invade other areas of the body through blood.

While we do not know or understand all the causes and risks of cancer, there are a number of chemical, physical and biological agents that have been shown to trigger the mutations in cells that cause cancer. These cancer-causing agents are called carcinogens; they include tobacco, ultraviolet radiation, chemicals, pollution and asbestos.

The extent of cancer in Australia

In general, the prevalence of cancer in Australia is increasing, with over 120 000 new cases diagnosed each year. This is by no means a new trend, with cancer incidence rates increasing steadily since the 1990s and expected to continue to increase. There are a number of reasons for this trend, including:

- advancements in methods of detection – for example, mammograms for breast cancer, pap smears for cervical cancer and prostate-specific antigen (PSA) testing for prostate cancer all mean an increase in detection of cancers
- increased awareness of warning signs and more widespread use of personal detection – for example, breast self-examination and skin checks
- an ageing population – the risk of developing cancer increases with age, so having a larger population of older people means more cases of cancer
- increased exposure to risk factors – for example, ultraviolet (UV) radiation and higher rates of obesity.

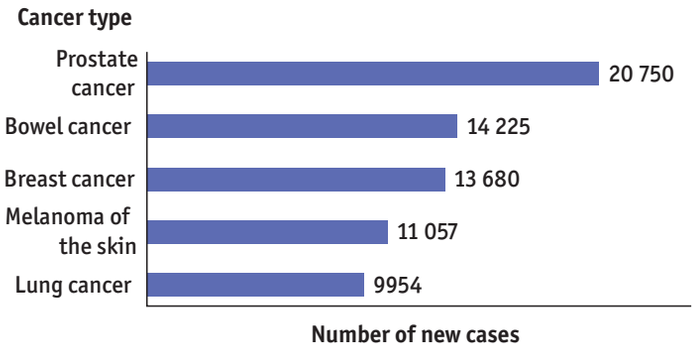


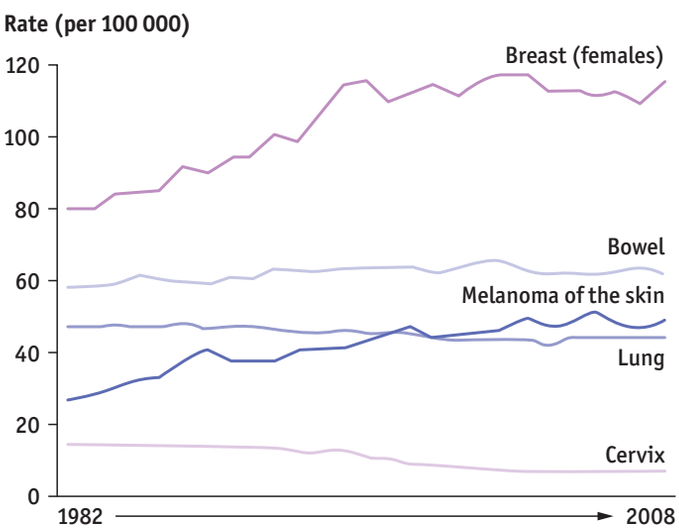
Figure 1.26 Incidence of the five most commonly diagnosed cancers, 2008

Note: The data pertain to cancers coded in ICD-10 as C61 for prostate cancer, C18–C20 for bowel cancer, C50 for breast cancer, C43 for melanoma of the skin and C33–C34 for lung cancer.
Source: Australian Cancer Database 2008, AIHW.

Source: Australia's Health 2012, p. 260.

While all cancers combined have shown an increase in incidence, there is a difference in the incidence and prevalence of some different types of cancer:

- Rates of prostate cancer have shown some fluctuation since 1991. However, most of the fluctuations over the years have been due mainly to changes in techniques of diagnosis and detection.
- Rates of breast cancer rose between 1991 and 1995 with the introduction of national screening programs in women, but since then they have remained fairly stable.

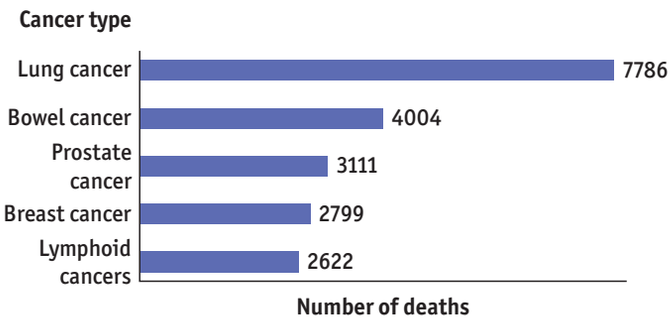


Source: Australian Cancer Database 2008, AIHW.

Figure 1.27 Incidence of selected cancers

Source: Australia's Health 2012, p. 261.

ISBN 978-1-107-43512-4



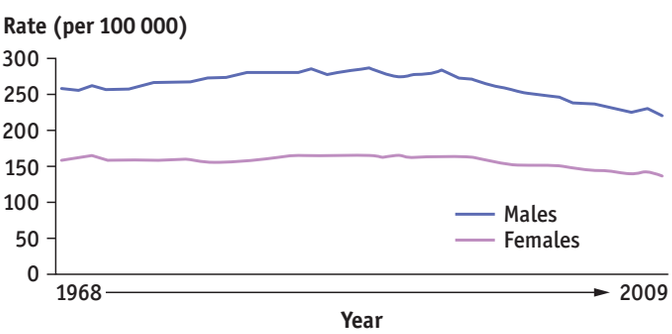
Notes:
1 The data pertain to cancers coded in ICD-10 as C33–34 for lung cancer, C18–C20 for bowel cancer, C61 for prostate cancer, C50 for breast cancer, and C81–C85, C88, C90 and C91 for lymphoid cancers.
2 Lymphoid cancers are cancers that start in lymphocytes (white blood cells) of the immune system. The most common types are lymphoma, myeloma and lymphoid leukaemia.

Source: ABS 2011a.

Figure 1.28 Most common causes of death from cancer, 2009

Source: Australia's Health 2012, p. 263.

- Lung cancer incidence has been decreasing in males but increasing in females. This can be linked to the different patterns of smoking rates between men and women, as smoking rates in females peaked later than in males.
- Increases in incidence rates for melanoma of the skin have increased for both males and females. The increase in incidence in males was much more significant than in females, with a 62 per cent increase in incidence in males compared with an increase of 18 per cent in females between 1991 and 2009. Rates of skin cancer are expected to remain more stable from 2010.
- From 1991, cervical cancer, lip cancer and stomach cancer have all shown decreases in incidence.



Sources: AIHW National Mortality Database for deaths in 1968–2006, and AIHW analysis of ABS unpublished confidentialised data for deaths in 2007–2009.

Figure 1.29 Trends in mortality rates for all cancers combined, 1968–2009

Source: Australia's Health 2012, p. 264.

While there have been overall increases in incidence rates for cancer, **mortality** rates are decreasing. Cancer is the second leading cause of death in Australia, and is the cause of three in 10 deaths among the population. Males have higher rates of death from cancer than females, and for both males and females the average age for a death due to cancer is 73.

mortality the number of deaths from a specific cause or in a specific population over a period of time (usually one year)

In males, lung cancer is the leading cancer that causes death, followed by prostate cancer, bowel cancer and pancreatic cancer. In females, lung cancer causes the most deaths, followed by breast cancer and then bowel cancer.

From 1991 to 2010, the following trends in mortality for specific cancers were evident:

- Mortality rates for lung cancer showed a decrease for men but an increase for women. Once again, this can be due to the changes in smoking habits for men and women.
- Mortality from bowel cancer has decreased for both men and women.

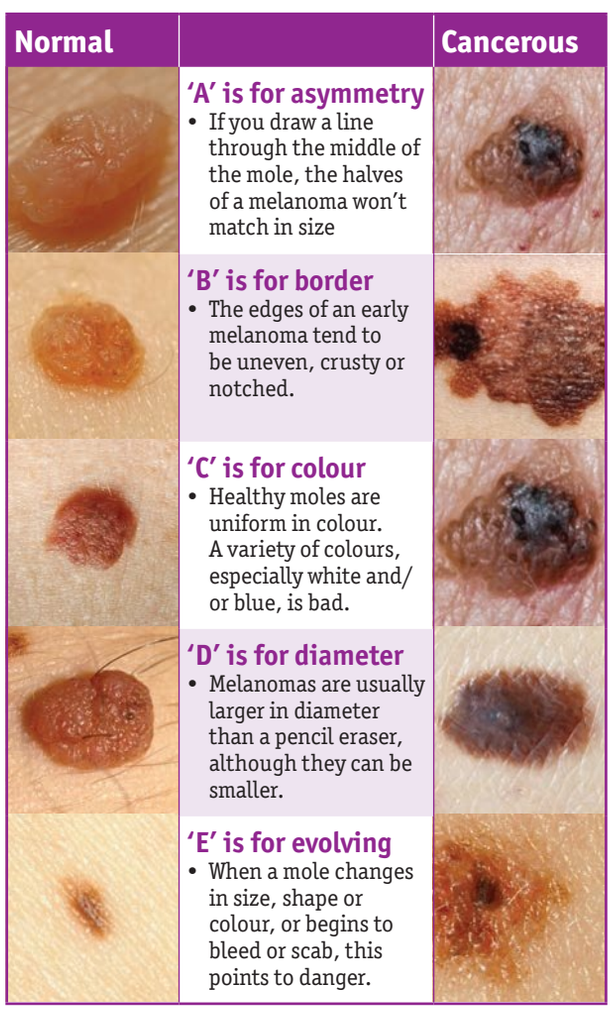


Figure 1.30 Features of normal vs. cancerous moles. A protective factor for skin cancer is monitoring of moles and freckles.

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- Both prostate and breast cancer mortality rates have decreased, although recent decreases have been much less significant.

Many of the decreases in mortality rates described above can be attributed to advances in detection techniques, increased screening programs and greater awareness, which has led to earlier detection and a better prognosis for treatment and survival.

Risk factors and protective factors for cancer

As with CVD, the risk factors for cancer can be divided into two categories: modifiable and non-modifiable. Risk factors vary depending on the type of cancer.

Skin cancer

The main cause of skin cancer is exposure to UV radiation. In most cases, this is from exposure to the sun; however, in some cases it may include exposure to radiation from sources such as solariums. There are a number of other factors that have been associated with an increased risk of skin cancer. They include:

- exposure to sun during childhood
- having a fair complexion, light-coloured, blond or red hair and/or fair skin that freckles or burns easily
- a family history of melanoma
- having several large or many small moles.

Protective factors for skin cancer include monitoring moles and freckles, and limiting exposure to the sun – especially during times of peak UV radiation – by wearing sunscreen, a hat, protective clothing and sunglasses.

Breast cancer

A number of factors are associated with an increased risk of breast cancer – that is, they are more common in women with breast cancer than those without. These factors are not necessarily 'causes' of breast cancer, but may be signs that someone has an increased likelihood of developing the disease.

The major risk factor for breast cancer is, of course, gender. Increasing age is also one of the

Breast screening program is reaching target age group, but lower participation among some groups

More than 1.3 million women aged 50–69 (the target age group) were screened through BreastScreen Australia in 2010 and 2011, according to a report released today by the Australian Institute of Health and Welfare (AIHW).

The report, *BreastScreen Australia monitoring report 2010–2011*, shows that just over half (55%) of women in the target age group for free breast screening had a mammogram in 2010–11, but screening rates remain lower among certain population groups.

Participation in breast screening was lower among certain population groups, such as women in very remote areas, Aboriginal and Torres Strait Islander women, and women who reported speaking a language other than English at home.

'The difference between Aboriginal and Torres Strait Islander and non-Indigenous women was greatest, with 36% of Aboriginal and Torres Strait Islander women having a screening mammogram in 2010–11, compared with 54% of non-Indigenous women,' said AIHW spokesperson Justin Harvey.

Among women screened for the first time in 2011, further investigation was required for 11%, and of women attending subsequent screens, 4% were recalled. Women are recalled for further investigation if any anomalies are found. This allows for early intervention if breast cancer is detected.

'A high proportion of breast cancers detected in 2011 were small – 50% of those attending their first screen, and 63% of those attending subsequent screens,' Mr Harvey said.

'Small breast cancers (less than 15 millimetres in diameter) are associated with better treatment options and improved treatment outcomes and survival.'

In 2009, there were 7022 new cases of breast cancer diagnosed in Australian women aged 50–69. This is equivalent to about 288 new cases per 100 000 women.

Breast cancer incidence has remained steady at around 290 per 100 000 women since 2003.

In 2010, 1098 women aged 50–69 died from breast cancer, equivalent to 43 deaths per 100 000 women, making breast cancer the second most common cause of cancer-related death for Australian women after lung cancer.

Breast cancer mortality dropped from 68 to 43 per 100 000 women between 1991 (when BreastScreen Australia began) and 2010. This has largely been attributed to the early detection of cancers through screening practices, such as BreastScreen Australia, along with advances in management and treatment.

In recent years, breast cancer mortality has continued to drop – from 52 deaths to 43 per 100 000 women between 2005 and 2010.

Source: AIHW media release (see www.cambridge.edu.au/hscpdhpe1weblinks).

ISBN 978-1-107-43512-4

Going further 1.20

Inquire

Read the media release 'Breast screening program is reaching target age group, but lower participation among some groups' on page 30.

1. **What role do mammograms and preventative screening play in increasing survival rates for breast cancer?**
2. **Given the improved survival rate from early detection, why do you think there is still a large number of women who do not access the free service?**
3. **What factors could contribute to the lower screening rates of Aboriginal and Torres Strait Islander peoples whose first language is not English and remote-area women? Suggest ways in which these factors could be addressed.**

strongest risk factors, with the risk increasing from one in 250 at the age of 30 to one in 30 for a woman over the age of 70. Women who have a close family relative – mother, sister or daughter – with breast cancer are twice as likely to develop breast cancer themselves as someone who does not have a close relative with breast cancer. As well as the non-modifiable factors just mentioned, some risk factors are related to lifestyle choices, and include being overweight or obese, consuming over three alcoholic drinks per day and a later maternal age (over 40 years).

Protective factors for breast cancer include practising regular self-examination and regular mammograms when over the age of 50, as well as leading a healthy lifestyle – including being physically active, eating a balanced diet and not drinking excessive amounts of alcohol.

Lung cancer

The most obvious risk factor for lung cancer is smoking. The younger the age at which a person begins to smoke and the longer a person has been smoking, the higher the chance of developing lung cancer. Other factors that may contribute to a higher risk include occupational exposure to carcinogens such as asbestos and lead, and exposure to pollution and second-hand smoke.

Protective behaviours against lung cancer include not smoking or quitting. The risk of developing lung cancer drops by up to 50 per cent 10 years after a person quits smoking. Avoiding exposure to hazardous materials such as asbestos also decreases the chance of developing lung cancer.

Socio-cultural, socio-economic and environmental determinants of cancer

Family behaviours can have a significant influence on the risk of cancer. A family that has healthy eating habits, exercises regularly and practises safe behaviours such as covering up in the sun reduces the risk of cancer. Some family factors cannot be controlled, however, and a family history of cancer – especially a member of the immediate family – increases the risk of cancer. Some cultural groups experience higher rates of cancer. Aboriginal and Torres Strait Islander peoples have higher rates of lung cancer, as they have higher rates of smoking and less access to health services.

Some forms of employment can increase the risk of cancer. Jobs that involve exposure to harmful substances such as asbestos may increase the risk of lung cancer, whereas those who work in jobs that involve regular exposure to the sun are more prone to skin cancer. Lower income and lower levels of education can contribute to higher death rates from cancer. This is due to the decreased access to health services, limited options for food and physical activity, and decreased awareness of risk and protective behaviours that may result.

People living in rural and remote areas are more at risk due their geographical isolation. The distance from health services may limit their access to protective services such as pap smears, breast screening and prostate tests.

Groups at risk of developing cancer

The following groups are at higher risk of developing the specific types of cancer.

Lung cancer

- smokers
- men and women over the age of 50
- people with occupational exposure to carcinogens such as asbestos or lead

Breast cancer

- women past menopause
- women who have never given birth or who first gave birth over the age of 40
- women who are obese
- women with a direct relative who has, or has had, breast cancer
- women who do not self-examine their breasts

ISBN 978-1-107-43512-4

Skin cancer

- people with fair skin who tend to freckle or burn easily and/or blond or red hair
- people who have an outdoor occupation and are frequently exposed to the sun
- people who have spent too much time in the sun without protection.

Diabetes

The nature of diabetes

In order to function, our body requires energy from food. To be able to use the energy from food, it must be processed by our body and converted into a form that our cells can use. In people who suffer from diabetes, there is a breakdown in this process.

When we eat, our stomach and small intestines break down the carbohydrates found in food and convert them into a type of sugar called glucose. This glucose is then absorbed into the bloodstream, ready to be either used for energy or stored in our body for later use.

Insulin is a hormone made in the pancreas that is released in response to eating. Insulin enables the glucose to move from the bloodstream into the cells. If there is not enough insulin being produced in the pancreas, or the insulin being produced is ineffective, then the glucose cannot move into the cells to be used for energy, and instead remains circulating in the blood. This condition is called diabetes.

There are three different types of diabetes:

- **Type 1 diabetes – insulin-dependent diabetes mellitus**. In type 1 diabetes, the pancreas does not produce enough insulin or it does not produce any at all. By monitoring their blood sugar levels and injecting artificial insulin up to four times a day, type 1 diabetics can control their blood sugar levels and keep their condition under control. Symptoms of type 1 diabetes include excessive thirst, frequently passing urine, always feeling hungry, blurred vision, headaches and tiredness. It is not known what causes type 1 diabetes, but it is known to have a strong family link and cannot be prevented.
- **Type 2 diabetes – non-insulin diabetes**. Type 2 diabetes is the most common form of diabetes and affects 85–90 per cent of all people with diabetes. In this type of diabetes, the body produces insulin but the amount produced is insufficient or ineffective. Type 2 diabetes is the result of a combination of lifestyle, genetic and environmental factors, and in over 50 per cent of cases can be prevented. While there is a strong genetic predisposition, the risk of developing diabetes is greatly increased by factors such as high blood pressure, overweight or obesity, poor diet and a lack of physical activity. There is no cure for type 2 diabetes, but in most cases it can be managed with healthy eating and exercise in the early stages. As time progresses, it may become necessary to take tablets or have insulin injections to help control it. In many cases, people will not have any symptoms but when they do they will be the same as for type 1.
- **Gestational diabetes** is a form of diabetes that occurs during pregnancy. Pregnant women require two or three times more insulin than normal. If the body cannot produce enough insulin, then gestational diabetes develops. In many cases, it disappears after birth but increases the risk of the woman developing type 2 diabetes.

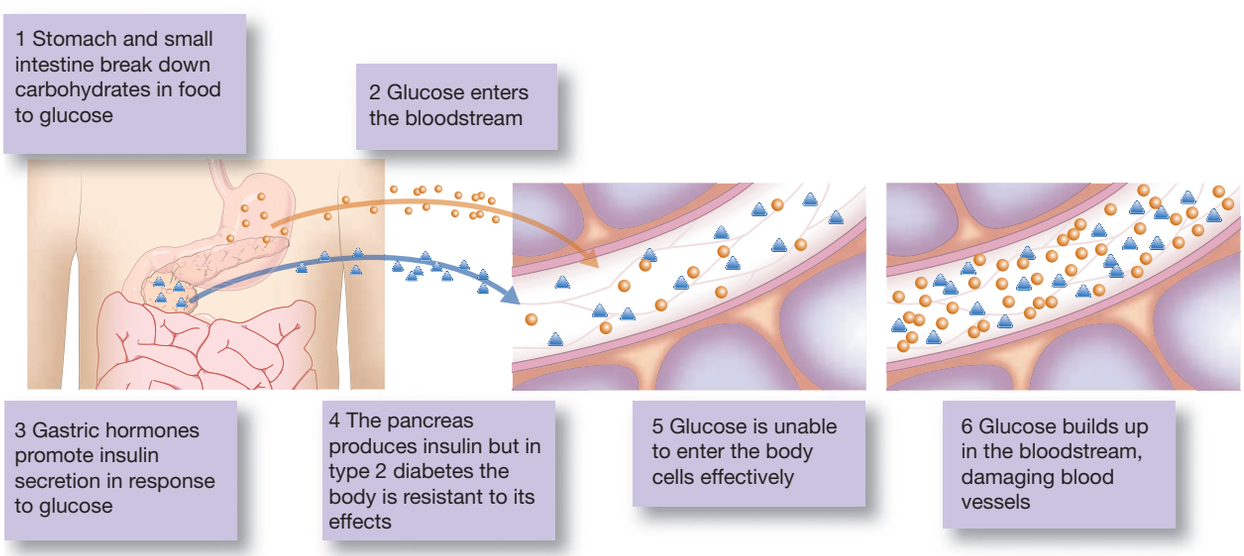

Figure 1.31 Pathology of diabetes

ISBN 978-1-107-43512-4

Age	Number	Per cent (%)
0–34	55 900	5.6
35–44	73 100	7.3
45–54	152 200	15.2
55–64	242 500	24.3
65–74	279 100	27.9
75 and over	196 300	19.6
Total[(b)]	**999 000**	**100.0**

Table 1.5 People ever diagnosed(a) with diabetes, by age, Australia, 2011–12

(a) Estimates based on survey participants' self-reported information.
(b) Total diabetes excludes gestational diabetes.

Source: ABS Australian Health Survey, 2011–12.

The extent of diabetes in Australia

Diabetes in Australia is a growing issue. From 1990 to 2012, the rates of diabetes more than doubled, with 4.2 per cent of the population diagnosed with diabetes in 2012. Of these people with diabetes, around 11.9 per cent had type 1 diabetes and around 84.9 per cent had type 2. Rates of diabetes are higher in males than in females, and increase with age.

Diabetes can result in a range of short- and long-term complications, and these are the major causes of deaths and hospitalisations among people with the disease. Short-term complications are medical emergencies and include diabetic ketoacidosis (which can result from a severe lack of insulin in those with type 1 diabetes) and hypoglycaemia (low blood glucose, which is a complication of treatment). These conditions can be life threatening.

Long-term complications of diabetes develop over several years, and include disease of the large blood vessels (macrovascular disease), which may lead to conditions such as coronary heart disease, stroke and peripheral vascular disease; and disease of the small blood vessels (microvascular disease), which can cause chronic kidney disease, nerve damage and loss of vision.

- In 2010, nearly 7750 Australians died from diabetes and causes related to diabetes, accounting for 5.4 per cent of all deaths in that year. However, this is a reduction of 20 per cent from 1997.
- Diabetes expenditure accounted for 2 per cent of total disease expenditure in 2008–09.
- Type 1 diabetes is uncommon in the Aboriginal and Torres Strait Islander population, but there is a very high prevalence of type 2 diabetes, with rates almost three times as high for Aboriginal and Torres Strait Islander peoples than for the rest of the population.

Risk factors and protective factors for diabetes

Key risk factors in the development of type 2 diabetes are:

- being overweight or obese, due to the insulin resistance that can be caused by increased body weight
- being over 45 and overweight
- having had gestational diabetes or polycystic ovarian syndrome
- being over 45 and having high blood pressure
- having had a heart attack
- being over 35 and of Aboriginal or Torres Strait Islander descent
- being over 35 and having a Pacific Island, Indian or Chinese background.

Awareness of these risk factors can encourage people to take steps to modify their behaviours in order to reduce their risk. Protective behaviours for type 2 diabetes include:

- regular physical activity
- eating a healthy, balanced diet
- maintaining a healthy body weight.

Socio-cultural, socio-economic and environmental determinants of diabetes

Family and social environment can contribute to risk factors that increase the chance of developing diabetes. A family with a history of diabetes, poor

Going further 1.21

Inquire

Read the article 'The inconvenient truth about diabesity' (see www.cambridge.edu.au/hscpdhpe1weblinks).

1. **To what does the term 'diabesity' refer, and why is it becoming a more regularly used term?**
2. **Outline the socio-cultural and environmental factors that are contributing to the increasing rates of diabetes and obesity in Australia.**
3. **What is the impact on the health-care system and the Australian nation if prevalence rates of diabesity continue to increase in the way that they have been over the past 10 years.**
4. **According to the article, what factors can make it a difficult issue to address?**
5. **Evaluate the effectiveness of higher taxes on junk food as a method for addressing the issue of obesity.**

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diet and lack of physical activity will be at much greater risk of developing type 2 diabetes. These poor lifestyle behaviours frequently are associated with SES, with higher rates of overweight and obesity, lower rates of physical activity, higher rates of alcohol consumption and poorer nutritional choices, all more common in lower SES groups. Lack of education about risk factors and warning signs may also be a factor in low SES groups.

Environmental factors that may contribute to diabetes include increased access to labour-saving technology and fast food. An environment that does not promote healthy lifestyle choices, such as physical activity, may also increase the likelihood.

Groups who are at risk of developing diabetes

- people with a family history of diabetes
- women who have had gestational diabetes
- overweight people
- Aboriginal and Torres Strait Islander peoples
- people over 45 – especially if they are overweight or have high blood pressure.

Respiratory disease

The nature of respiratory diseases

Respiratory diseases incorporate a wide range of diseases that affect the respiratory tract to varying degrees. They are very prevalent in Australia and cause disruption to life for many. The two major respiratory diseases in Australia are chronic obstructive pulmonary disease (COPD) and asthma.

COPD is characterised by progressive damage of the lung tissue and narrowing of the air passageways, leading to difficulty breathing and shortness of breath. COPD causes many deaths per year (8 per cent of all deaths for 2007–08), although these rates have been decreasing. The major cause of COPD is smoking, which is estimated to be responsible for over 70 per cent of all COPD cases.

Asthma is a chronic inflammatory condition of the airways. Various triggers can cause the airways of a person with asthma to narrow, making it difficult to breathe.

The three main factors responsible for the narrowing of the airways are:

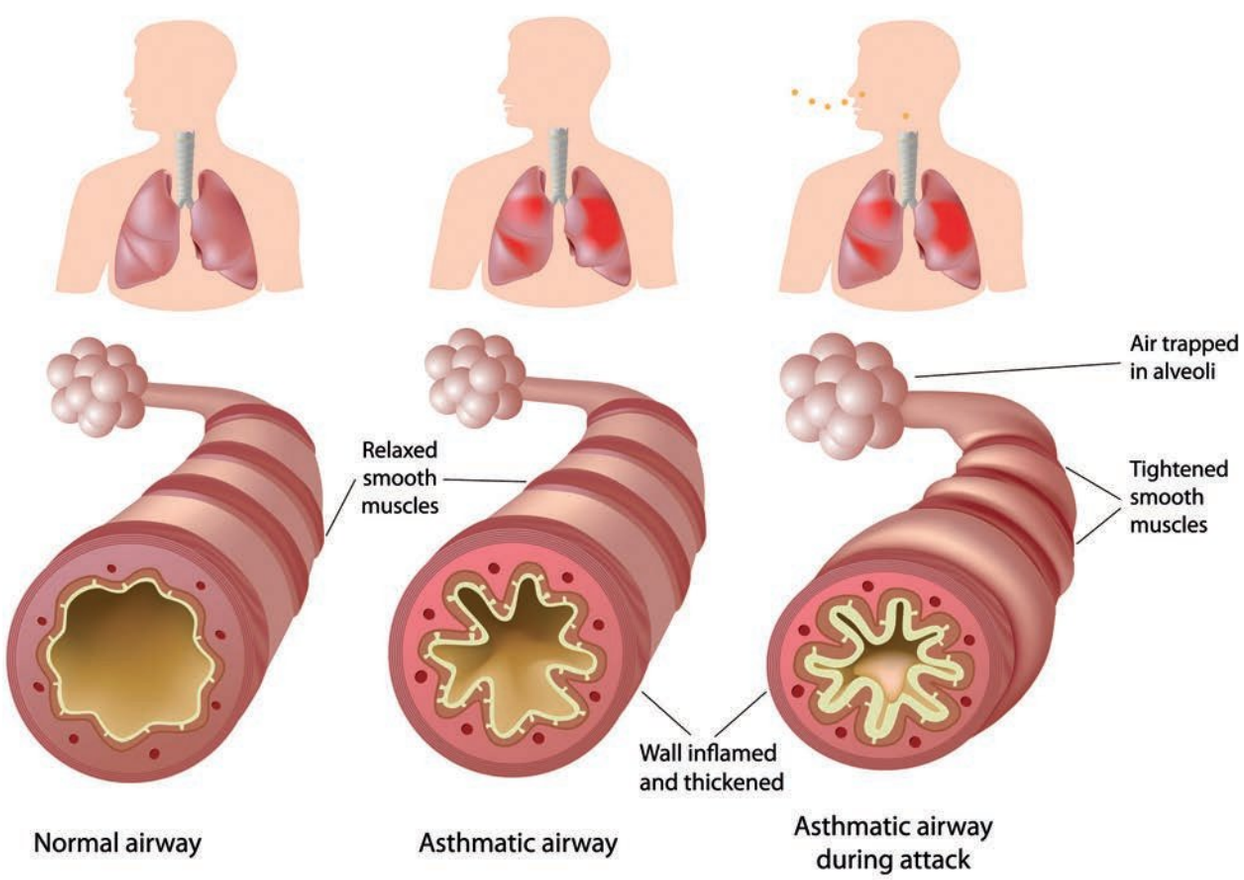

Figure 1.32 Pathology of asthma

ISBN 978-1-107-43512-4

- The muscles around the airway tighten (bronchoconstriction).
- The inside lining of the airway becomes inflamed and red.
- Extra mucus is produced, which obstructs the airway.

This narrowing of the airways may produce the following symptoms:

- coughing
- wheezing
- chest tightness
- shortness of breath
- difficulty breathing.

Symptoms of asthma may vary from person to person, and may change over time. If a severe attack occurs, a person can die.

There is no cure for asthma, but with the use of preventer and reliever medication it can be well managed and the impact on an individual's life lessened.

The extent of respiratory disease

Asthma

The prevalence of asthma in Australia is high by international comparison, with approximately one in 10 Australians reported to suffer from asthma. The trends are positive, however, with both **morbidity** and mortality rates decreasing over the last 10 years. Asthma can affect quality of life and the people with asthma generally report worse health than those without.

morbidity the incidence of illness, injury and diseases that do not result in death in a specific population

In children under the age of 14, asthma is more common among girls than boys, but in those aged 15 and above the trend is reversed.

There are higher rates of asthma in the Aboriginal and Torres Strait Islander population than the rest of the population, and higher rates among those of low SES.

COPD

COPD predominantly affects older people and prevalence increases with age. COPD causes more deaths than asthma, but the mortality rate has been decreasing, with a decrease in mortality rate of 65 per cent between 1997 and 2007. COPD is commonly associated with cancer.

The major risk factor for COPD is smoking, which is estimated to be the cause of 70 per cent of cases of COPD. Other causes include inhalation of other pollutants and irritant gases. Rates of smoking are higher among Aboriginal and Torres Strait Islander peoples, people of low SES and those in rural and remote areas.

There is no known cause for asthma, but there have been some strong links drawn between family history and asthma. Triggers for asthma attacks vary from person to person, and can include:

- changes in temperature or cold air
- pollen, dust mites or other inhaled irritants
- exercise
- smoke
- illnesses such as colds or flu
- food additives
- aerosols
- certain drugs.

Protective factors for asthma predominantly involve the preparation of an asthma action plan. Developed in conjunction with a doctor, the plan identifies prevention strategies, triggers that may cause an attack, and how to treat and manage an attack if one occurs. As the difference in symptoms and severity of asthma can vary so greatly from person to person, it is imperative that the plan reflects the individual needs of each person. With well-controlled asthma, a person may experience very few symptoms.

Groups at risk of respiratory disease

Rates of asthma are higher in Aboriginal and Torres Strait Islander peoples and lower in people born in other countries. Death rates from asthma are higher among those living in rural and remote areas due to the difficulty of accessing emergency care in the case of a severe attack.

Injury

Injury is a major contributor to the burden of disease in Australia. It affects people of all ages, and leaves many with disability and long-term health conditions. In most cases, injury is preventable.

The nature of injuries

An injury is physical damage that can result from many different causes, including:

- sport and recreation related injuries – for example, sprains, strains and concussion
- transport-related injuries – for example, a car accident
- interpersonal violence – for example, stabbing, bashing
- self-inflicted injury, including suicide
- occupational injuries
- residential injuries – for example, falls, cuts, burns, poisoning and drowning.

The impact that an injury has on an individual can vary greatly and can affect all areas of life, causing

	Males		Females		Persons	
External cause	**Number**	**%**	**Number**	**%**	**Number**	**%**
Unintentional injuries						
Transport	35 658	14.3	17 331	9.2	52 999	12.2
Drowning and submersion	311	0.1	184	0.1	495	0.1
Poisoning, pharmaceuticals	3 297	1.3	3 301	1.7	6 598	1.5
Poisoning, other substances	1 400	0.6	842	0.4	2 242	0.5
Falls	75 795	30.4	96 819	51.2	172 616	39.4
Smoke, fire, heat and hot substances	3 923	1.6	2 135	1.1	6 058	1.4
Other unintentional injuries	98 462	39.5	42 386	22.4	140 850	32.1
Intentional injuries						
Intentional self-harm	9 748	3.9	16 314	8.6	26 062	5.9
Assault	16 470	6.6	6 144	3.3	22 616	5.2
Undetermined intent	3 001	1.2	2 472	1.3	5 473	1.2
Other or missing	1 390	0.6	993	0.5	2 383	0.5
Total	249 455	100.0	188 921	100.0	438 382	100.0

Table 1.6 Major external cause groups for hospitalised injury cases, by sex, Australia, 2010–11

economic, physical and social burdens to the victim and the community.

Consequences of injury can include:

- death
- permanent or temporary physical or mental disability
- decreased productivity due to time off, pain or decreased functioning
- financial cost of medical treatment and rehabilitation
- emotional trauma
- decreased social function due to loss of mobility, emotional trauma or pain.

The extent of injuries in Australia

Mostly preventable injuries in Australia accounted for 6.5 per cent of the total burden of disease in 2010. According to *Australia's Health 2012*:

- One in 20 hospitalisations in Australia in 2009–10 were the result of injury.
- Males had much higher rates of hospitalisation from injury than females in all age groups under 65.
- Rates of hospitalised injury were highest in the 15–24 years age group.
- Rates of injury over the past 10 years have shown a slight increase.
- Two of the main causes of injury in 2010–11 were falls (39 per cent) and transport accidents (12 per cent).

External cause	Trend	% change per year	% of all injuries 2010–11
Unintentional injuries			
Transport	↔	–	12.0
Drowning and submersion	↓	–0.9′	0.1
Poisoning, pharmaceuticals	↓	–4.6′	1.5
Poisoning, other substances	↓	–3.7′	0.5
Falls	↑	1.7′	39.4
Smoke, fire, heat and hot substances	↔	–	1.4
Other unintentional injuries		1.4′	32.1
Intentional injuries			
Intentional self-harm	↑	0.5′	5.9
Assault	↔	0.5	5.2

*Average per cent change per year differed from zero to a statistically significant extent ($p < 0.05$).
** Average per cent change per year was small (<0.1%) and did not differ significantly from zero ($p < 0.05$).

Table 1.7 Trends in age – standardised rates of hospitalised injury cases by type of external cause, Australia, 1999–2011

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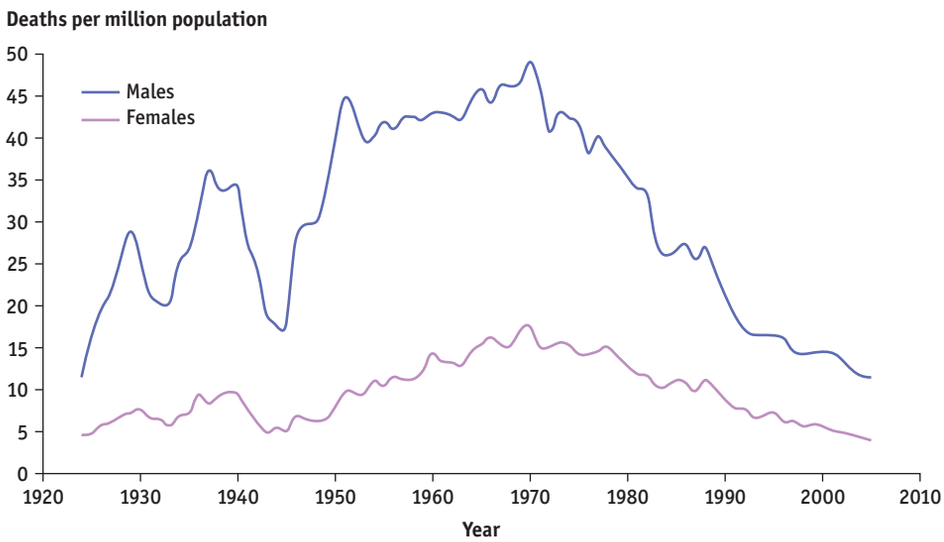

Note: Rates have been age-standardised to the Australian population as at 30 June 2001.
Source: AIHW National GRIM Books.

Figure 1.33 Trends in death rates for motor vehicle accidents, 1924–2005

- The injury mortality rate for males is more than twice that for females.
- Mortality from unintentional injuries is decreasing, but mortality from intentional injuries is increasing.
- Suicide, transport injuries and falls are the leading causes of injury death.

Transport-related injuries

Transport-related injuries were more common in males (35 658 cases) than females (17 331 cases), and rates were highest for the 15–24 years age group.

There has been a significant downward trend in deaths due to motor vehicle accidents since the 1970s, and the rates are continuing to decline.

Child accidents

Almost half of the deaths in the 1–14 years age group are due to injury from accidents. The most common cause of death is due to transportation, then drowning, poisoning, falls and fire/burns. Trends are showing a decline.

Going further 1.22

Communicate

1. Through class discussion, propose reasons for the decreases in road deaths since the 1970s.
2. What key strategies have been introduced in the last 10 years to address the over-representation of young people in crash statistics?
3. Pick two strategies you identified in Question 2 and evaluate their effectiveness.

Rank	0–14	15–24	25–64	65 and over
1	Falls	Other unintentional(b)	Other unintentional(b)	Falls
2	Other unintentional(b)	Transportation	Falls	Other unintentional(b)
3	Transportation	Falls	Transportation	Transportation
4	Smoke, fire and flames, heat and hot substances	Intentional, inflicted by another	Intentional, self-inflicted	Poisoning, pharmaceuticals
5	Poisoning, pharmaceuticals	Intentional, self-inflicted	Intentional, inflicted by another	Intentional, self-inflicted

(a) By proportion.
(b) Other unintentional injury includes a broad range of causes, such as exposure to inanimate mechanical forces (W20–W49), exposure to animate mechanical forces (W50–W64), other accidental threats to breathing (W75–W84), exposure to electric current, radiation and extreme ambient air temperature and pressure (W85–W99), contact with venomous animals and plants (X20–X29), exposure to forces of nature (X30–X39), over-exertion, travel and privation (X50–X57), and accidental exposure to other and unspecified factors (X58–X59).

Table 1.8 Top 5(a) external causes of all hospitalised injury(b), by age group (years), 2009–10

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Type of injury	Main group affected	Risk factors	Protective factors
Road injury	Young males 15–24	• Sense of invincibility or complacency may lead to greater risk-taking • Inexperience on the road • New-found power • Lack of judgement • Peer pressure • Driving during early morning or late at night • Drinking or drug use and driving • Distractions in the car, including passengers, music, phone, etc.	• Adhering to road rules • Ensuring well rested before driving • Not driving under the influence of drugs or alcohol • Ensuring vehicles are well maintained • Limiting distractions in the car
Childhood accidents	Children	• Inadequate supervision • Unsafe environment – for example, a pool without a fence, poorly maintained play equipment, access to chemicals and dangerous objects such as work tools • Distraction and lack of awareness of things such as road rules – for example, running out on to the road without looking	• Ensuring children are supervised • Keeping dangerous chemicals and tools locked away and out of children's reach • Adequate pool fencing • Wearing helmets and other protective equipment when participating in physical activities such as bike riding
Falls	Elderly	• Limitations in mobility and performing daily tasks • Impairments in balance, vision, reaction time, walking • Use of medications or multiple medications • Uneven surfaces and lack of support structures such as railings	• Wearing sensible shoes with adequate grip and support • Physical activity to decrease losses in mobility, balance, strength and general muscle function • Wearing vision-correcting glasses • Ensuring medicines are correctly prescribed and used
Suicide	Males	• Mental disorders, particularly mood disorders, schizophrenia, anxiety disorders and certain personality disorders • Alcohol and other substance abuse • Sense of hopelessness • History of trauma or abuse • Major physical illnesses • Previous suicide attempt • Family history of suicide • Significant negative life event, such as death of a loved one, relationship breakdown or loss of job • Lack of health care, especially mental health and substance-abuse treatment	• Effective care for mental, physical and substance use disorders • Restricted access to highly lethal means of suicide • Strong sense of connectedness • Good support network • Skills in problem-solving, conflict resolution and stress management • Cultural and religious beliefs that discourage suicide

Table 1.9 Risk and protective factors for injuries

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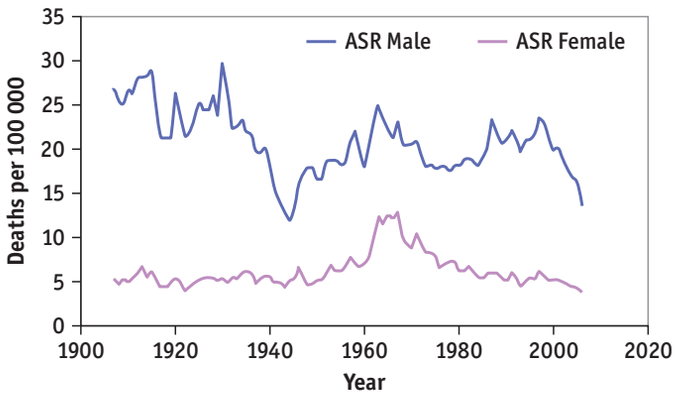

Figure 1.34 Trends in death rates for suicide in Australia, 1907 to 2006

Risk factors and protective factors for injury

Identifying and modifying the risk factors to which individuals and the whole community are exposed can reduce the risk of death and disability from injury. Different injuries are generally the result of the interaction of a number of different risk factors in varying degrees that are specific to the injury.

Suicide

In the 1990s, suicide became the leading cause of death from injury (32 per cent of all deaths), overtaking motor vehicle accidents (decreasing in incidence). There has been a decline in suicide rates over the last few years, but suicide still claims more lives than road accidents and skin cancer.

ABS data reveal that men are more at risk of suicide than women, and Indigenous Australians are four times more likely to commit suicide than non-Indigenous people. The extent and impact of suicide is difficult to measure accurately, as suicide is under-reported and has a significant impact on the wider community. Also not included in the mortality rate is the extent of suicide attempts. It is thought that for every one completed suicide, there are 30 attempts.

Socio-cultural, socio-economic and environmental determinants of injury

Changing lifestyle patterns of young people today from those of previous generations have possibly resulted in higher levels of depression. As young people seek greater independence, they can be confronted with unemployment, homelessness, an inability to develop relationships, drug use, extra responsibilities and pressures. Changing family structures also mean there are more families with two parents in the workforce. This may contribute to childhood accidents due to less supervision. Low SES families may also have less money for better quality safety devices and lower levels of education.

- Mortality rates from injuries are three times higher in Indigenous than non-Indigenous populations. This is largely linked to lower levels of education and less access to treatment.
- Geographical location can influence the risk and degree of injury. Significantly more road fatalities occur on country roads than metropolitan roads, so people living in rural and remote areas are at much higher risk. People living in rural and remote areas are also more at risk of suicide due to the lack of access to support, higher rates of emotional stress and lower employment rates.
- Occupational hazards such as working with machinery or working in an environment that may involve some exposure to danger increase the risk of a workplace-related injury.
- The media have played an influential part in reducing road accidents in today's society. Shock tactics and educational commercials have had some impact on road-user behaviours.
- Increased community participation in driver reviver schemes has also played an important role in reducing road accidents.
- The independence of youth – for males in particular – is characterised by motor vehicle ownership. Owning and driving a car is a symbol of adulthood and masculinity, and coupled with the desire to drive fast, is a significant contributing factor to the high death rate due to motor vehicle accidents in the 15–24 years age group.

Groups at highest risk of injury

- elderly people (mainly through falls)
- males 15–24 years of age
- drivers who speed and/or drink-drive
- young children
- workers in high-risk occupations (construction, mining).

Preventing suicide

Suicide warning signs and what to do if you think someone is at risk

The SuicideLine website has a 'Recognising Suicide Warning Signs' tip sheet (see www.cambridge.edu.au/hscpdhpe1weblinks).

Mental health problems and illness

Greater attention is being paid to issues of mental health, as the impact of mental illness on people's health and well-being is becoming more apparent.

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Mental illness affects a significant proportion of the population, with one in five Australians experiencing a mental illness in any year.

The nature of mental illness

There is a broad spectrum of mental illness and mental health problems that affect the Australian population to varying degrees. A mental illness/disorder is a health issue that significantly affects a person's feelings, behaviours, thoughts and interactions with other people, and is diagnosed according to a set of criteria. Some of the different types of mental disorders in Australia are anxiety disorders, mood disorders, schizophrenia, depression and substance-use disorders.

A mental health problem can also affect a person's thoughts, feelings, behaviours and interactions with others, but generally in a less severe way. These are more common than mental illnesses, and include the mental ill-health someone may experience in response to a stressful situation like a death or relationship breakdown. If not dealt with in a positive way, mental health problems can turn into mental illness.

Mental illness can have a severe and lasting impact on a person's life, as well as those around them. Although it affects people of all ages, mental illness is more prevalent in the 18–24 years age group.

Mental illness can be classified as psychotic or non-psychotic. Psychotic illnesses are less common, and involve a loss of sense of reality; the person may start to hear, see or feel things that are not there. Some psychotic mental illnesses include schizophrenia and bipolar disorder.

Non-psychotic mental illness involves the experience of very exaggerated emotions. While everyone may have feelings of fear, anxiety and sadness at some point, a mental illness occurs when these emotions become so strong and overwhelming that they start interfering with a person's ability to live their life and to perform daily tasks. Anxiety and depressive disorders fall into this category, and are the most common mental illnesses.

Mental illness/ mental health issue	Nature	Extent	Risk factors
Depression	• Depression is more than just feeling sad for a day or two; it is diagnosed when these feelings go on for two weeks or more. • Symptoms can include loss of motivation, difficulty sleeping, feeling worthless and loss of interest in things once enjoyed.	• Experienced by one in seven Australians during their life and the most common mental health issue in young Australians. • Third highest burden of disease in Australia. • Depression is the largest cause of non-fatal disability. • Expected by the WHO to be the leading health issue in the world by 2030.	• Family history of depression • Biochemical imbalance – in most cases, this can be treated with medication • Stress – can be brought on by a stressful life event • Personality – some people are more prone to depression– for example, perfectionists • Other mental health issues
Suicide	• Taking or attempt to take one's own life.	• Leading cause of death for Australians aged 15–24. • Every day six Australians commit suicide and 30 more attempt it unsuccessfully. • There are higher rates of suicide among men than women (men = 76.9 per cent).	• Depression • Access to means to commit suicide
Bipolar	• Person experiences extreme mood swings – oscillating from extreme highs (manic episodes) to extreme lows (depressive episodes). • In many cases it can be controlled with medication and moods levelled out.	• Generally there is a significant time gap between the first episode and diagnosis. • Bipolar disorders may affect up to 6 per cent of the population but to varying degrees.	• Genetic predisposition • Biochemical imbalances in the brain • May be triggered by stress • Seasonal changes may influence a person's manic and depressive episodes

Table 1.10 Extent and risk factors for mental illness in Australia, 2007

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Checklist 1.23

1 For CVD:
   a What is the nature of the problem?
   b What is the extent of the problem?
   c What are the risk factors and protective factors?
   d What are the socio-cultural, socio-economic and environmental determinants?
   e Which groups are most at risk?
2 For cancer:
   a What is the nature of the problem?
   b What is the extent of the problem?
   c What are the risk factors and protective factors?
   d What are the socio-cultural, socio-economic and environmental determinants?
   e Which groups are most at risk?
3 For one other group:
   a What is the nature of the problem?
   b What is the extent of the problem?
   c What are the risk factors and protective factors?
   d What are the socio-cultural, socio-economic and environmental determinants?
   e Which groups are most at risk?

Extent of mental illness in Australia

The National Survey of Mental Health and Wellbeing 2007 estimated the extent of mental illness in Australia. Some of the main general findings are outlined below and then in Table 1.10 – for more specific illnesses.

- One in five Australians experiences a mental illness in any given year.
- Often mental illnesses will occur in combination – for example, a person with depression may develop a substance-use problem in an attempt to deal with their depression.
- Of the 20 per cent of Australians with a mental illness, 11.5 per cent have one disorder and 8.5 per cent have two or more disorders.
- It is expected that 45 per cent of Australians will experience a mental illness in their lifetime.
- Some 65 per cent of people with a mental illness do not access treatment.

Socio-cultural, socio-economic and environmental determinants of mental illness

Factors that may contribute to the development of a mental illness can include stressful life events such as the loss of a job, relationship breakdown, loss of a loved one or another traumatic experience. Changing family structures may also contribute.

Other factors may include the stress associated with a family's or individual's financial situation or occupational stress. Lack of education about the warning signs for a mental illness, poor knowledge of what to do or where to go to access help and the negative stigma attached to mental illness may provide barriers to someone seeking help.

A growing and ageing population

Driving questions 1.24

Consider what is unique about Australia's demography.

1 How many people live in certain areas and how is this projected to change in the future?
2 What impact will this have on health services in the future?

With one in nine persons in the world aged 60 years or over, projected to increase to one in five by 2050, population ageing is a phenomenon that we can no longer ignore. Increasing longevity is one of humanity's greatest achievements. Indeed; population ageing is cause for celebration.

The opportunities that this presents are as endless as the contributions that a socially and economically active, secure and healthy ageing population can bring to society.

Opportunities come with challenges, however. Population ageing presents social, economic and cultural challenges to individuals, families, societies and the global community.

It is how we choose to address the challenges and maximize the opportunities of a growing older population that will determine the future of humankind.

Source: Babatunde Osotimehin, Executive Director, United Nations Population Fund, *Ageing in the Twenty-First Century: A Celebration and A Challenge*, New York, UNFPA and London, HelpAge International (2012) (see www.cambridge.edu.au/hscpdhpe1weblinks).

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> Population ageing can no longer be ignored. Globally, the proportion of older persons is growing at a faster rate than the general population. This reflects tremendous and welcome advances in health and overall quality of life in societies across the world. But the social and economic implications of this phenomenon are profound, extending far beyond the individual older person and the immediate family, touching broader society and the global community in unprecedented ways. On the positive side, population ageing has opened up new markets and brought us more experienced workers, a growing cadre of custodians of culture, and caregivers of grandchildren. But it is also presenting major challenges, most notably ensuring the sustainability of pension funds and the ability of already overburdened health-care systems to serve much higher numbers of people. These implications, as well as the fact that new generations of older persons will be more educated, must be taken into account in policies and programmes that reflect changing age structures.
>
> *Source:* Ban Ki-moon, United Nations Secretary General, *Ageing in the Twenty-First Century: A Celebration and A Challenge*, New York, UNFPA and London, HelpAge International (2012) (see www.cambridge.edu.au/hscpdhpe1weblinks).

Australia has a population of approximately 23.26 million, with an annual growth rate of about 1.8 per cent. This is based on estimates that there is:

- one birth every one minute and 44 seconds
- one death every three minutes and 32 seconds
- a net gain of one international migrant every two minutes and 19 seconds, leading to
- an overall total population increase of one person every one minute and 23 seconds.

Older people represent an increasing proportion of this population. Currently, older people (over the age of 65) make up about 14.4 per cent of the population, and this is expected to increase to almost 25 per cent over the next 35 years. This increase is being driven by two main factors, the first of which is a decline in birth rates. The birth rate in Australia has been declining since the 1960s, and has now fallen to below replacement rate. This means that without migration, our population would eventually start decreasing. The second factor is that life expectancy has increased.

So, with fewer babies being born but more people living longer, it is inevitable that the population will get progressively older and that this demographic shift will have a significant impact on all aspects of individual and community life.

Healthy ageing

Healthy ageing has become a key priority, not just for the Australian

healthy ageing behaviours that reduce the risk of illness and disease in older people

WHO Healthy Ageing Strategy

On World Health Day in 2012, WHO identified a comprehensive strategy to encourage healthy and active ageing and address contributing issues throughout the life course. These four principles are listed below:

1 **Promoting good health and healthy behaviours at all ages to prevent or delay the development of chronic disease.** This includes being physically active, maintaining a healthy diet, avoiding the harmful use of alcohol and not smoking or using tobacco products. These behaviours can all reduce the risk of chronic disease in older age. They need to start in early life and continue into older age.

2 **Minimising the consequences of chronic disease through early detection and quality care (primary, long-term and palliative care).** While we can reduce the risk of chronic disease through a healthy lifestyle, many people will still develop health problems in older age. We need to detect metabolic changes such as high blood pressure, high blood sugar and high cholesterol early and manage them effectively. But we also need to address the needs of people who already have chronic disease, care for those who can no longer look after themselves, and ensure that everyone can die with dignity.

3 **Creating physical and social environments that foster the health and participation of older people.** Social determinants not only influence the health behaviours of people across the life-course; they are also an important factor in whether older people can continue to participate. It is therefore important to create physical and social environments that are 'age-friendly', and foster the health and participation of older persons.

4 **Reinventing ageing.** Social attitudes must change to encourage the participation of older people in society. Many current attitudes to ageing were developed during the twentieth century, when there were far fewer older persons and social patterns were very different. These patterns of thinking can limit our capacity to identify the real challenges and seize the opportunities of population ageing in the twenty-first century. We need to develop new models of ageing that will help us create the future society in which we want to live.

Source: United Nations Population Fund, *Ageing in the Twenty-First Century* (2012) (see www.cambridge.edu.au/hscpdhpe1weblinks).

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government but for the entire world. With a global aged population that is expected to reach 20 per cent of the entire population by 2050, the implications for our society will largely be determined by whether older people are in good or poor health. The high rates of chronic disease and disability in the aged population can be significantly decreased or prevented through active and healthy ageing.

Healthy ageing is not just a concept that applies to the elderly; it begins in the younger years. Much of the poor health and chronic disease experienced in later years is attributable to earlier choices and behaviours, such as smoking, poor diet and low levels of exercise. Healthy behaviours need to start earlier, and continue throughout life.

The benefits of healthy ageing are not just experienced by the individual but also the wider community. For an individual, healthy ageing means improved quality of life with fewer years lived in illness and with disability, decreased health-care costs and more opportunities for social interaction. This will in turn have an effect on the wider community, and means a decreased financial impact on the health-care system through reduced burden of disease and fewer people requiring aged care facilities and palliative care. There is a reduced burden on families and friends, as less care and assistance is required. Further to that, older people have a wealth of skills and experiences that can benefit society. Healthy ageing means that these skills and experiences can be utilised for longer. Involvement in volunteer work and community services, and provision of care for children and other older people, are just some of the benefits of a healthy older population.

The importance of healthy ageing is reflected in the Australian government's aged care reform package, 'Living Longer, Living Better'. It aims to increase the independence of older people and the number of healthy years lived, through a wide variety of support services for the elderly and the general population to encourage decisions that promote health, both now and in the future.

Increased population living with chronic disease and disability

One of the challenges of an ageing population is the increased pressure that will be placed on the health-care system as the result of higher numbers of people living with chronic disease and disability. Chronic disease accounts for approximately 80 per cent of the burden of disease, and it is expected that by 2020 it will be responsible for three-quarters of all deaths.

Positive lifestyle choices in the younger years can help to reduce the prevalence of lifestyle-related chronic disease. Other diseases such as Alzheimer's and other forms of dementia cannot be prevented or cured, however, and will place significant pressure on the health-care system as the number of sufferers increases.

For example, the number of Australians with dementia is expected to increase from around 220 000 in 2007 to over 730 000 by 2050. This will place significant pressure on carers, health services and government funding, as dementia is one of the most disabling health conditions. A large proportion of people with severe and advanced dementia require full-time care and live in aged care accommodation.

There will also be an increase in the prevalence of comorbidity (people living with two or more diseases at the same time). This will create greater diversity in the needs of older people, and the provision of care, especially among the over-85s, where it will present new challenges in caring for the very frail.

Demand for health services and workforce shortages

As previously mentioned, the increase in the number of people living with chronic health conditions will place growing demands on health services and aged care. The need for health care increases with age, and those over 65 are the largest consumers of health-care services. A response has already been seen in the health-care industry, with the number of aged care facilities growing by 46 per cent since 2002.

At the same time, growth in the number of people of workforce age is expected to plateau. This could cause problems, as the older population is reliant on workers and taxpayers for support. In 2002, for every person over the age of 65, there were more than five people of working age to support them. By 2042, this number is expected to drop to only 2.5 workers for every elderly person.

In response to concerns about health-care pressures and challenges, the government produced the National Strategy for an Ageing Australia, which focuses on addressing the key challenges of an ageing population on a national level and identifies four key areas to be addressed:

- **Increasing independence and self-provision**. This includes increasing employment for mature aged workers and keeping workers as productive members of the workforce for longer, which will assist in decreasing workforce shortages and decrease the economic burden.

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Going further 1.25

Inquire

Research three different types of aged care or aged support services that are present in your local community. Outline the different services they provide.

- **Positive attitudes, lifestyle changes and community-based support**. This involves fostering attitudes among the elderly as well as the community about the capabilities of the elderly, acknowledging their contributions to society and reducing stereotypes.
- **Promotion of and support for healthy ageing**. This is necessary to increase quality of life and the potential for contributions by the older generation as well as decreasing the burden of disease.
- **World-class care**. This means the provision of sustainable, accessible and high-quality care for older Australians.

Australia already has some systems in place to care for and support the elderly. Australia's retirement income system is considered a model of good practice by the World Bank, and supports older Australians through a combination of public pensions, superannuation and voluntary savings. The taxpayer-funded age pension is means tested and is not linked to previous earnings. It is provided to almost 80 per cent of the population who are old enough to receive it. Compulsory superannuation funds are also required from all employers, with employees able to make additional payments into their fund in preparation for retirement.

Availability of carers and volunteers

An important proportion of Australia's workforce is made up of volunteers and carers. As Australia's population ages, the number of people requiring informal care, at home and in their community, is expected to increase, while the number of available carers declines. This is because in many cases the carers and volunteers themselves are also ageing.

In 2001, there were 57 primary carers for every 100 people over 65 years of age with a severe or profound disability needing care and living in the community. By 2031, this ratio is projected to drop to just 35 carers for every 100 people aged over 65 needing care. The number of aged people needing care is projected to rise by 160 per cent. This means there will be a shortfall of 573 000 informal primary carers compared with the current shortfall of 152 000.

Carers are important for providing support and assistance to the elderly, to enable the performance of daily tasks such as feeding, bathing, dressing, administering medications and transport. The degree to which a carer is needed will vary significantly depending on the individual's level of mobility and their degree of disability. There are many providers of aged care in our community, including aged care homes and retirement villages, private organisations, charitable organisations and community-based care facilities.

The majority of home- and community-based services are provided through the Home and Community Care (HACC) program, which provides a number of services that support the elderly in their own residence and includes home nursing services, delivered meals, help in the home – including home maintenance – transport and shopping assistance, health services, home- and centre-based respite care, and other forms of advice and assistance.

Summary 1.26

What is healthy ageing?

Checklist 1.27

1. **Assess the impact of a growing and ageing population on the health system and services.**
2. **Assess the impact of a growing and ageing population on the health service workforce.**
3. **Assess the impact of a growing and ageing population on carers for the elderly.**
4. **Assess the impact of a growing and ageing population on volunteer organisations.**

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1.3 The role played by health-care facilities and services in ensuring better health for all Australians

Health care in Australia

Driving questions 1.28

Reflect on the last five times you visited or used a health-care facility or service.

1. Who was responsible for running it?
2. What financial exchanges were made? (How was the service provider or facility being paid for?)
3. Were any of these visits to non-traditional, alternative or complementary health-care services?
4. Referring to your own experience, what do you think makes a health service fit into this category?

Health care in Australia is among the best in the world, which is reflected in the increasing rates of life expectancy, decreasing rates of infant mortality and overall positive self-ratings of Australians' health.

Health-care facilities across the country provide a wide variety of services for the prevention, treatment and management of injuries and illness. Over the past 50 years, changing views about health have led to a shift in the nature of the health industry, with a move from largely curative health-care services to health-care services that reflect a more holistic view of health.

Many of the major health problems experienced by Australians today are the result of poor lifestyle choices, so health-promotion and prevention strategies have become integral and essential

Better health	Focus on prevention	Appropriate care
Life expectancy	Risk factor prevalence (smoking, inactivity, high blood pressure, etc.)	Diabetes annual cycle of care
Infant and child mortality	Child developmental health checks	Antenatal checks
Incidence and prevalence of important preventable diseases	Cancer screening rates	Cancer survival
Potentially avoidable deaths	Low birthweight babies	In-hospital death rates
Accessible	Immunisation	Asthma plans
Service use differentials	Public health $(%)	Unplanned readmissions to hospital
Preventable hospitalisations and ED attendances	**Integration and continuity**	Health and aged care accreditation
Waiting times for services	Discharge summaries electronically transmitted	**Sustainable**
People receiving mental health care	Hospital discharge plans	Workforce inflows and outflows
Aged care services per disabled person 70+ yrs	GP register and recall system for chronic disease	Commonwealth and state funding of health and aged care
Hospital patients awaiting nursing home care	Post-discharge community mental health care	Training places
Out-of-pocket costs Deferring treatment due to cost	**Safe**	Capital expenditure
Efficient	Adverse events in care settings	R&D expenditure
Cost per hospital separation	Independent review of surgical deaths	**Patient-centred**
Cost per specialist service	VTE risk assessment	Patient experience

Key:

State/territory accountability	Joint accountability	Commonwealth accountability

Table 1.11 The health and aged care performance indicator set – primarily Commonwealth and state and territory accountabilities

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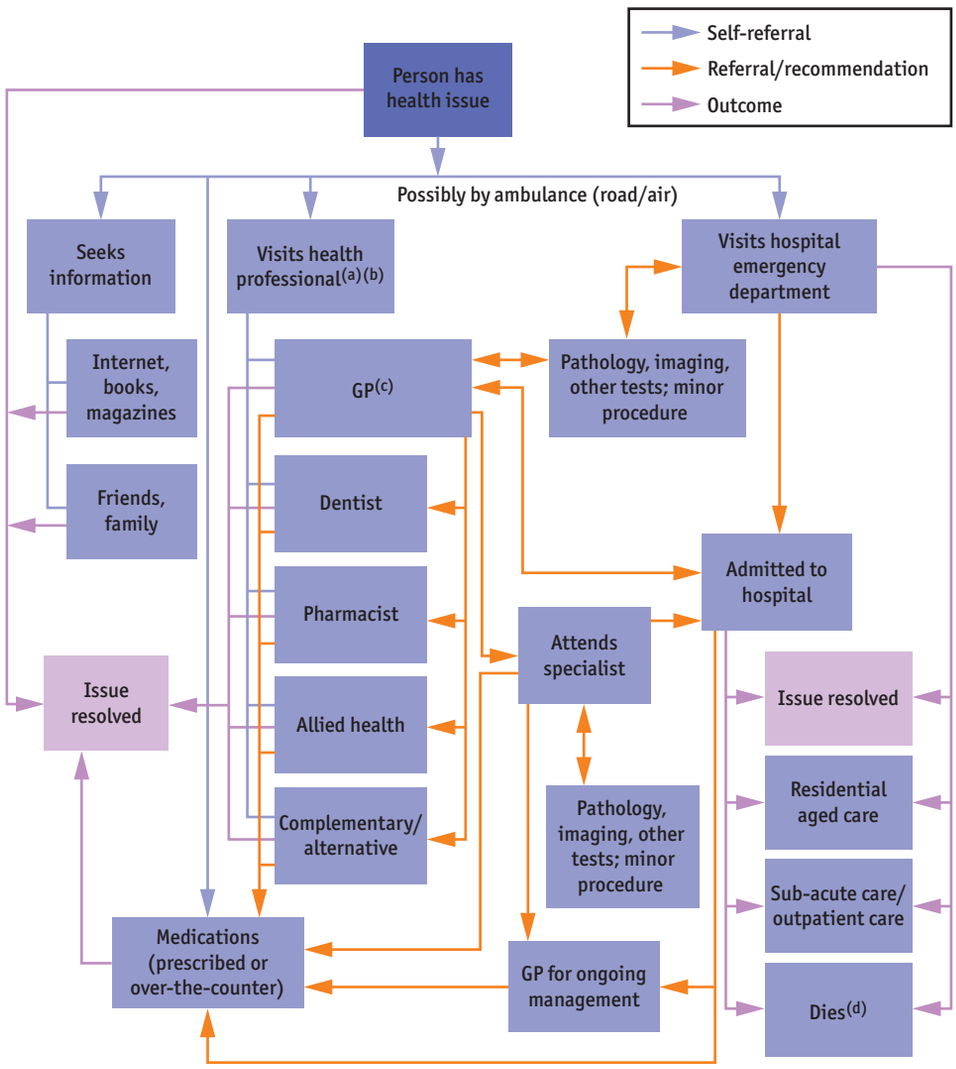

(a) This can include a telephone call to a health advice and referral service.

(b) The subcategories shown here are not complete, and may include community health services and clinics, and other services for which a referral is not required.

(c) This includes GP-like clinics provided by hospitals and community health services.

(d) The majority of deaths in Australia occur in hospital, although death can be an outcome anywhere in the patient's path through the system, or before any contact with the health system (such as in a motor vehicle accident).

Figure 1.35 Possible pathways through the health system

Source: Australia's Health 2012, p. 371.

elements of our health care. Recognition of the impact that the many determinants can have on our health have led to national health campaigns targeting negative health behaviours such as smoking through education, attitude change and support. One of the biggest challenges is finding the delicate balance between the allocation of resources for treatment and resources for prevention.

Indicators used for the evaluation of our health-care system include:

- better health
- focus on prevention
- access
- high quality – appropriate
- high quality – safe
- integration and continuity of care
- patient-centred
- efficiency/value for money
- sustainable
- equity.

Range of health-care facilities and services

The health-care system in Australia encompasses a wide range of health-care services, including institutionalised services such as hospitals and

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Public health services	Primary care and community health-care services	Hospitals	Specialised health services	Goods
Health promotion and education Cancer screening Immunisation	General practice activity Dental Private sector allied health Community health Complementary/ alternative health Ambulance and Royal Flying Doctor Service Primary health care for Aboriginal and Torres Strait Islander peoples	Admitted patient care Emergency department care Out-patient care	Specialist medical practitioners Specialised mental health Reproductive health Alcohol and other drug treatment Hearing Palliative care Australian Defence Force	Pharmaceuticals

Table 1.12 Health service categories
Source: Australia's Health 2010, p. 333.

Going further 1.29

Create
Alphabet challenge: Provide examples of both institutional and non-institutional health facilities and services for every letter of the alphabet.

nursing homes, and non-institutionalised services such as public health programs and the vast range of health professionals working in the community.

Hospitals

There are 1326 hospitals operating in Australia: 753 public hospitals and 573 private hospitals. In 2009–10, there were about 8.6 million hospitalisations and 7.4 million presentations to emergency departments in Australia.

Public hospitals

Public hospitals are operated and funded by the state and Commonwealth governments, and provide highly specialised services. Patients can access public hospitals through emergency departments, where they may present on their own initiative, through ambulance services or after referral from a general practitioner (GP). Public hospital emergency and outpatient services are free under **Medicare** arrangements, as is in-patient treatment for public patients. Public hospitals treat a higher proportion of elderly and young children.

Medicare government health service that provides equitable health care

People can also choose to be treated as private patients when they are in hospital, regardless of whether the hospital is a public or a private hospital. Private patients can select their treating specialist, but charges then apply for all of the hospital's services (such as accommodation and surgical supplies). Medicare subsidises the fees charged by doctors, and private health insurance contributes to medical fees and hospital costs.

Patients can also access a range of health-care services through public hospital out-patient clinics. The services provided commonly include allied health such as dietetics, occupational therapy and podiatry, as well as orthopaedic, oncology, dental and obstetrics. Other non-admitted care

Figure 1.36 Hospital entrance

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often provided through public hospitals includes radiology and imaging services, pathology and pharmacy.

Private hospitals

Private hospitals are owned and managed by individuals or community groups. They also have emergency departments that patients can access in the same way as public hospitals, provided they have private health insurance. Private hospitals tend to perform more elective procedures (not emergencies), such as some orthopaedic procedures and procedures on the nose, ear, throat and musculoskeletal system.

Psychiatric hospitals

Psychiatric hospitals treat and care for patients with a range of psychiatric, behavioural and mental health issues. In recent years, there has been a shift from long-term care in a psychiatric hospital to a model of care that incorporates hospital care with ongoing care within community settings. The ongoing care for these patients in community settings is provided by a team that typically includes the patient's treating GP, community-based mental health services, private psychiatrists and residential mental health facilities.

Nursing homes

Nursing homes provide long-term care for those who are no longer able to look after themselves independently. The elderly, chronically ill, disabled and dementia patients make up the majority of patients in nursing homes.

Primary care and community health services

General practitioner

For many health issues, the patient's first contact with the health-care system is presenting to their GP. General practice plays an integral role in the provision of primary health care in Australia. GPs diagnose, treat and manage health complaints, provide preventive advice and care, prescribe medicines, and refer patients to other health professionals, hospitals and aged care. In 2010–11 there were 125 million claims totalling $5.3 billion made through the Medicare Benefits Schedule (MBS) for general practice consultations.

Other health professionals/services

Medical specialists and allied health professionals provide specialist services in public and private hospitals, as well as in the community through private practice. Many patients are referred to these health professionals by their GP; however, you do not need to be referred by a GP to use these services. Allied health is a collective term used to describe a number of health professionals, including physiotherapists, dieticians/nutritionists, podiatrists, chiropractors and exercise physiologists, as well as others.

A recent government initiative has been the establishment of HealthDirect Australia – a telephone advice service staffed by health professionals (see www.cambridge.edu.au/hscpdhpe1weblinks). This service answers questions about health with the use of specialist software that provides advice and information as well as recommendations if further help is required. Another emerging health service is telehealth (see www.cambridge.edu.au/hscpdhpe1weblinks), which provides health-care services through the use of communications and computing technology – for example, a person in a rural or remote consulting with their GP through video conferencing. Such initiatives will allow for greater access to health services for people in rural and remote areas, or those for whom travel and mobility can be issues. They also aim to reduce unnecessary visits to the doctor, decreasing Medicare costs and pressure on GPs.

Community health-care services include those provided through local health services or governments. They include services like community nurses, women's health services, immunisation program implementation, rehabilitation programs and preventative health education.

Patient reason for encounter	% of total RFEs	Rate per 100 encounters
Check-up – all*	8.8	13.7
Prescription – all*	7.7	12.0
Test results*	5.2	8.0
Cough	4.3	6.7
Immunisation/ vaccination – all*	3.1	4.8
Back complaint*	2.0	3.1
Throat symptom/ complaint	2.0	3.1
Rash*	1.7	2.7
Administrative procedure – all*	1.7	2.6
Blood test – all*	1.7	2.6

*Includes multiple IPC-2 or ICPC-2 PLUS codes.

Table 1.13 GP consultations – top 10 patient reasons for encounter, 2010–11

Source: Australia's Health 2012, Table 7.2.

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Figure 1.37 For many health issues, the patient's first contact with the health-care system is presenting to their GP

Public health

Public health services focus on prevention and health-promotion strategies rather than treatment, and are aimed at populations not individuals. These preventative and promotional strategies focus on addressing the behaviours and factors that cause ill-health, and promoting those behaviours associated with good health. Public health campaigns use a variety of methods, such as health education and advertising campaigns, lifestyle advice including telephone-based services, immunisation programs and infection control in order to promote healthy lifestyle choices and behaviours.

Specific examples include cancer screening initiatives for breast, bowel and cervical cancers. BreastScreen Australia provides free screening services to targeted females, the National Cervical Cancer Screening Program offers pap smear tests that are covered by Medicare and National Bowel Cancer Screening uses faecal occult blood tests for those who have been invited to participate in the screening.

The National Immunisation Program provides childhood vaccinations for numerous illnesses and diseases, including diphtheria, tetanus, whooping cough, polio, measles, mumps, rubella, influenza, meningococcal, chickenpox and HPV (cervical cancer vaccine). These programs are delivered through school, hospitals, medical centres and GPs.

Responsibility for health-care facilities and services

Governments

Publicly accessible health-care services in Australia are provided by the Commonwealth, state and territory governments. Private health-care services are provided by a range of private and community groups.

Of the total health funding of $121.4 billion in 2009–10, the Australian government contributed 44 per cent, and state, territory and local governments 26 per cent. The non-government sector funded the remaining 30 per cent. This means that more than two-thirds of health-care spending was funded by governments, which is about the same contribution as during each year of the previous decade.

Commonwealth government

The Commonwealth government focuses on generating and allocating funding to the health-care system and the development of national health-care policy. Funding is provided to the state and territory governments by the Commonwealth government, which also influences policy development and implementation in the states. Funding is directly credited to the MBS and PBS schemes (60 per cent), with a further 24 per cent

Going further 1.30

Inquire

Read the SBS article 'Health crisis: growing overuse of antibiotics' (see www.cambridge.edu.au/hscpdhpe1weblinks)

1 What constitutes 'responsible use' of antibiotics?
2 Propose reasons for the increased misuse and over-prescription of antibiotics.
3 Outline the potential consequences that may result from the over-use of antibiotics and the impact this could have on Australia and the rest of the world.
4 According to the ABS, the use of medications has increased by over 50 per cent from 1996. Suggest reasons for the increased use of medications.

going to the states and territories, a smaller 8 per cent going to rebates for private health insurance and 7 per cent going to the support of veterans and their families.

The Commonwealth government is also responsible for health programs for specific groups such as Indigenous communities and war veterans, as well as providing funding for research, pharmaceuticals and public health initiatives.

State, territory and local governments

State and territory governments are responsible for delivering health-care services to the community, including:

- hospitals
- health promotion
- rehabilitation programs
- licensing, inspection, regulation and monitoring of premises, equipment and personnel
- mental health programs
- dental programs
- home and community care
- children's and adolescent health programs.

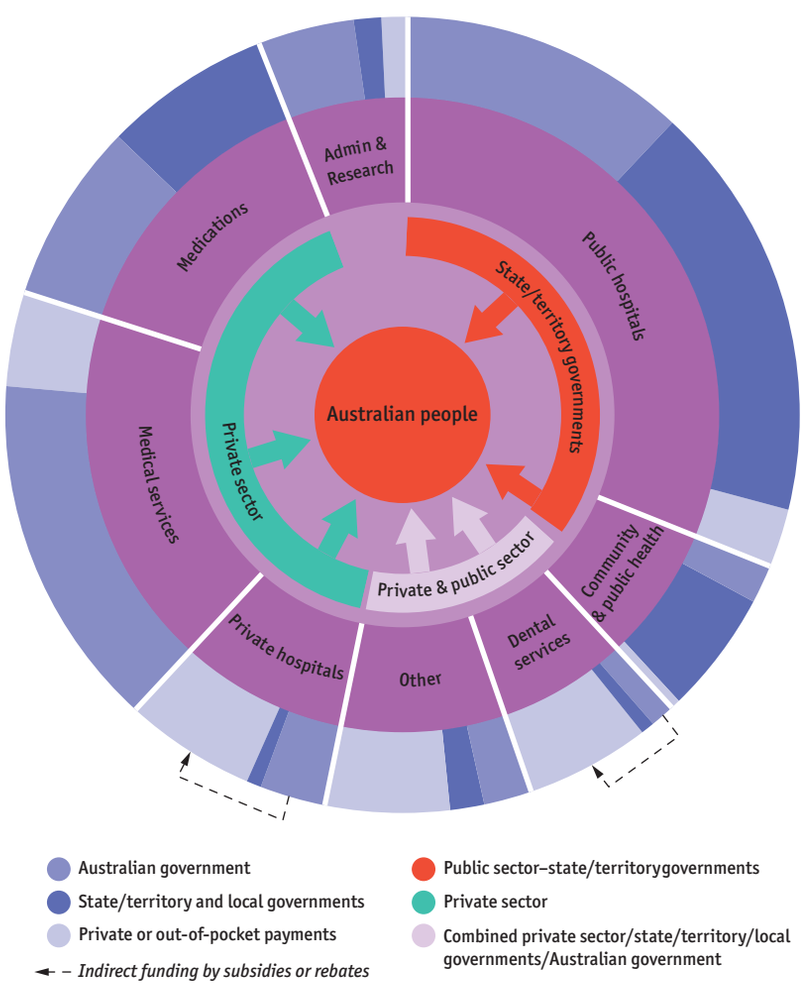

Figure 1.38 Health services – funding and responsibility

Source: AIHW, *State of Preventive Health 2013*, p. 30.

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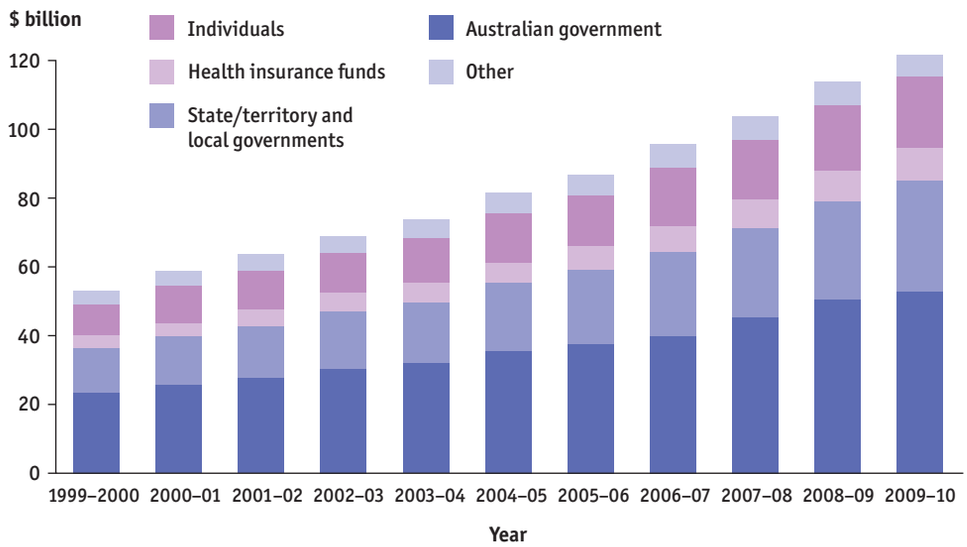

(a) Funding of spending by individuals includes non-specific tax expenditure (that is, the medical expenses rebate, which funds 20 cents of every dollar spent on health-related goods and services, once spending exceeds $2000 in a tax year).
Source: AIHW (2011).

Figure 1.39 Total funding for the health industry, by source, 1999–2000 to 2009–10
Source: Australia's Health 2012, Figure 8.3.

The main responsibility of local government is to monitor areas such as sanitation and hygiene, standards and compliance in the hospitality industry and Meals on Wheels. State governments may also oversee some of the health programs that are implemented by local governments, such as immunisation programs.

Private sector

A wide range of services is provided by the private health sector, including private hospitals, dental services and other health professionals in private practice. Although independent organisations, they must still comply with Australian standards for health care, and are approved by the Australian Department of Health and Ageing.

Many large-scale private health organisations, such as the Cancer Council, beyondblue and the National Heart Foundation, also receive funding from state and Commonwealth governments.

Equity of access to health-care facilities and services

Equity is a key measure of the performance of a health-care system. Australia works to achieve equitable access to health facilities and services for all Australians through several major avenues. Medicare is Australia's national health-care system, enabling access to health services by providing subsidised treatments for some medical practitioners, including GPs, and free treatment from public hospitals. The **Pharmaceutical Benefits Scheme (PBS)** is another national scheme that subsidises certain prescription medications, making it more affordable for all. In 2010–11, 201 million medicines were subsidised by the PBS, totalling $8.3 billion in payments.

Pharmaceutical Benefits Scheme (PBS) a government scheme that subsidises the cost of certain medicines

While the MBS and PBS are available to all Australians, there are still many groups within the population that face barriers to accessing health facilities and services. Cost can be a barrier, due to out-of-pocket expenses incurred from medications and services. Although there are rebates and subsidies for many services and medications, often the complete cost is not covered. Fewer GPs now bulk-bill, and there has been an increase in out-of-pocket expenses for prescription medications. The increasing demand for health services and the decreasing availability of health-care workers also mean that in some cases long waiting periods for non-emergency treatments and services are experienced. Other factors, including language, religion, culture and geographical remoteness, also hinder an individual's access to health services.

Medicare Locals are a recent government initiative to try to address some of these barriers and increase equitable access to health services and facilities for Australians. Medicare Locals were established in 2011 by the Commonwealth government as local organisations across the nation to deliver health services in response to specific

community needs. They have the flexibility to be innovative in the way they address the health needs of their community. Some examples of the programs include:

- establishing after-hours walk-in clinics to relieve the pressures on emergency departments
- providing funding to extend pharmacy and GP hours
- supporting services such as mobile GP and mobile x-ray services to reduce the burden on hospitals.

Australians who have private health insurance may have greater access to certain health-care services and procedures – for example, private patients may experience shorter waiting times for elective procedures. In order to address this with the aim of maintaining equity in health-care services for all Australians, categories have been developed to assess the urgency of patients' conditions.

Health-care expenditure versus expenditure on early intervention and prevention

A measure commonly used to describe and compare the size of health systems is the health-to-GDP spending ratio. It measures a country's spending on health as a percentage of its spending on all goods and services. Australia's health-to-GDP spending ratio grew from 7.9 per cent to 9.4 per cent ($121.4 billion) in the decade to 2009–10. The average spend on health per person was $6787 for Aboriginal and Torres Strait Islander peoples compared with $4876 for non-Indigenous people.

The Australian Institute of Health and Welfare's report *Australia's Health 2012* shows that over 90 per cent of recurrent health-care spending is allocated to the treatment of ill-health and disease, with only a very small percentage allocated to services and initiatives targeting early intervention and the prevention of ill-health. While this model of health-care spending exists, spending will continue to rise, as it costs significantly more to treat and cure a disease than to fund programs aimed at preventing it. Many of the leading causes of morbidity and mortality in Australia, such as cardiovascular disease, diabetes, accidents and injury, and certain cancers are associated with poor lifestyle behaviours. Investing in programs and services that aim to prevent these diseases has the potential to significantly reduce morbidity and mortality, as well as cut health-care expenditure.

In 2008–09, $7.9 billion was spent on the treatment and management of cardiovascular disease, a disease that is largely lifestyle related.

Figure 1.40 Geographical remoteness affects an individual's access to health services

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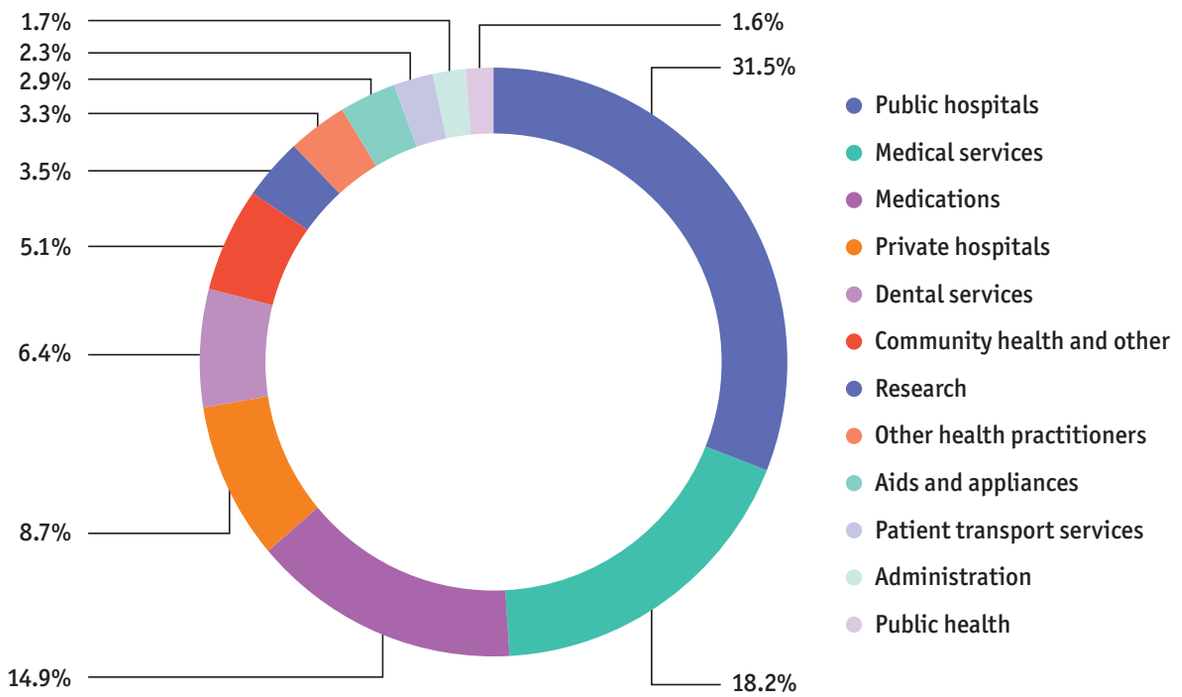

Figure 1.41 Preventative health expenditure

Source: State of Preventive Health 2013, p. 32.

There is a huge cost associated with treating and curing heart disease, stroke, high blood pressure, high cholesterol, blocked blood vessels and poor circulation, compared with focusing on preventative measures. Such measures may include funding education programs to promote healthy eating, weight control and physical activity, as well as creating public policy to develop supportive environments to encourage behaviour change.

There has been a slow shift towards preventative health, as evidenced by more preventative programs over the last decade. Such programs include Measure Up, QUIT, SunSmart, multiple drink-driving and driver-fatigue campaigns and cancer-screening programs for breast, bowel and cervical cancers.

It is widely recognised that health promotion is the most cost-effective way to address the social influences on health; however, it often takes years for preventative programs to translate into reductions in the incidence of disease. Unfortunately, health-care planning and spending are heavily controlled by governments who are reluctant to divert spending away from treating disease to preventing it, as the benefits of preventive programs may not be evident before the next election. Another factor that makes it very difficult to reduce spending on treatment of and cures for disease is the fact that many of our hospitals are under-staffed and require new equipment to support the health needs of an ageing population.

An example of long-term outcomes for prevention in Australia is tobacco control. In the early 1980s, the Commonwealth government began a targeted approach to increasing knowledge of the health risks associated with tobacco use. Health-promotion initiatives, including education, taxation, legislation, regulation, research and support programs, have provided an **inter-sectoral** approach to decrease the rates of smoking. These actions have been, and continue to be, successful.

inter-sectoral working with one or more sectors of society

Although the decline in smoking rates is clearly evident, and occurred within years of the implementation of the various interventions, the effects on the health industry came much later. As it takes time for lung cancer to develop, thus there is a lag in any decreases in lung cancer.

In 2011, the Australian National Preventive Health Agency was formed in response to several

Going further 1.31

Inquire

Identify from the graph in Figure 1.41 the top five expenses in preventative health care.

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Figure 1.42 Sid the Seagull has fronted the Cancer Council's SunSmart program since 1981

Source: Reproduced with the permission of Cancer Council of Australia.

reports on the state of Australia's health-care system and the recognition of a need to move towards preventive health action. The agency's current areas of focus are tobacco, obesity and alcohol. The targets surrounding these issues include a 10 per cent reduction in harmful alcohol use, a 10 per cent reduction in insufficient physical activity and a 30 per cent reduction in tobacco use by 2020.

Impact on health care of emerging technologies and treatments

Thanks to extensive research being conducted in the health-care industry, there have been significant advancements in the treatments and technologies used in health care over the past 20 years. Advancements have benefited the Australian community significantly, with improvements in diagnostics leading to more accurate, specific and timely diagnosis, which in turn increases the chances of successful treatment. Diagnostic procedures include ultrasounds, CT scans, MRI scans and pathology. Many of these are covered by Medicare.

A good example is the now commonly used keyhole surgery, which allows surgery to be performed through a small incision and a camera

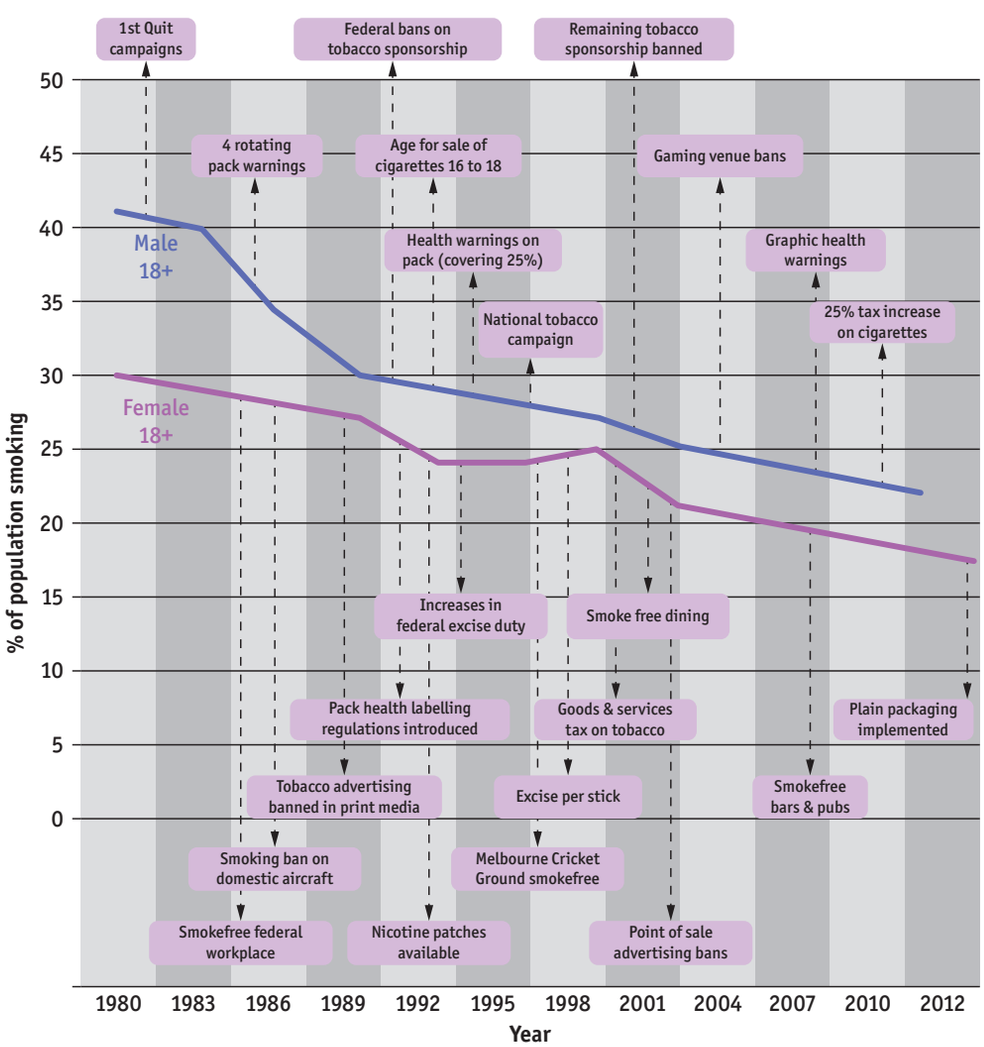

Figure 1.43 Preventative health in action to reduce tobacco smoking in Australia, 1980–2012

Source: State of Preventive Health 2013, p. 24.

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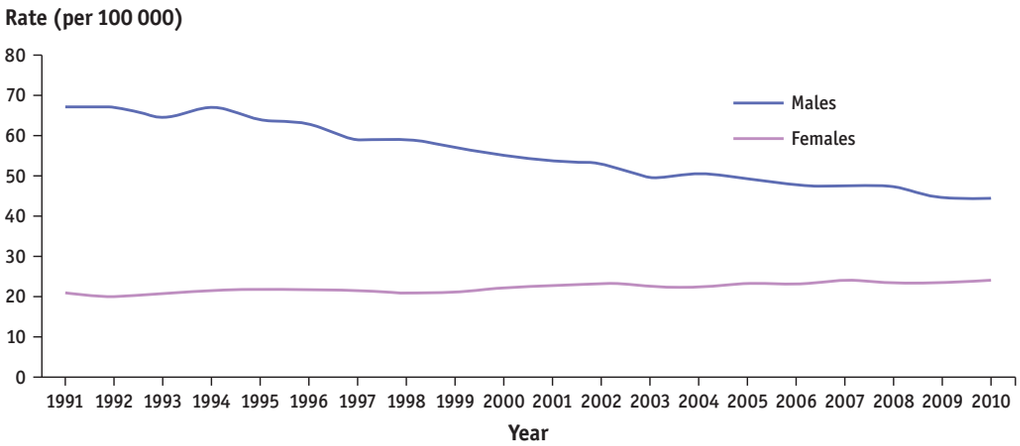

Notes:
1. Mortality data for 2009 and 2010 are revised and preliminary, respectively, and are subject to further revision.
2 The rates were age-standardised to the Australian population as at 30 June 2001.
3 Data for this figure are in online Table D3.3.

Figure 1.44 Trends in mortality from lung cancer, Australia, 1991–2010
Source: Cancer in Australia: An Overview 2012, p. 44.

inserted for viewing instead of traditional open surgery. The keyhole method provides numerous benefits, including significantly shorter length of procedure, quicker recovery time and a significantly reduced risk of infection, which all lead to shorter hospital stays for patients.

Another area of surgery that has been revolutionised by improvements in technology is orthopaedic procedures such as joint (knee, hip, ankle) replacement and repair. A complete knee replacement can now be done in less than two hours, and the use of laser guided technology ensures that the alignment of the new joint fits and functions as well as it possibly can.

All of these advancements have led to:
- increases in life expectancy
- improvements in quality of life
- more treatment options
- decreased time spent in hospital.

The development of new medications is also a rapidly growing area, with significant advancements made in the area of chemotherapy. A wide range of medications have been developed (at a significant financial cost) to treat conditions such as high blood pressure, type 2 diabetes and high cholesterol. While investments in these medications may improve an individual's health, the irony is that if the money had been spent on preventative measures such as promoting healthy eating and regular physical activity, there would be significantly fewer patients needing these medications.

Developments in the accuracy of health screening technologies have the potential to make a big impact on the health-care system through early detection and intervention. Examples where this is already occurring include the cancer screening programs for breast, bowel and cervical cancer. These screening programs enable the early detection of cancer, which can then be treated by an appropriate method that is usually fairly non-invasive and much cheaper compared with potentially major surgery, chemotherapy and/or radiotherapy, as well as the risk of the cancer spreading to other parts of the body.

Unfortunately, research and the development of such new technologies come at a significant financial cost, and therefore some technologies may be unaffordable unless they are subsidised by the government. In a health-care model treating an ageing population, where the majority of the spending is allocated to maintaining hospitals and treating ill-health, it is difficult for governments to invest in and subsidise all the technological advancements now available in health care.

When a new technology or medicine becomes available, the Australian government requires that it must be evaluated and approved before use. Cost, safety, risk and ethics are all considered. When the technology or medicine is approved, the

Going further 1.32

Collaborate

What is the trend for both males and females in terms of lung cancer deaths? In small groups, discuss the social and cultural influences that could be contributing towards this.

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government must decide whether to include it with the MBS or PBS. If it does become available, this results in increased access and usage, leading to increased costs for the government.

Health insurance: Medicare and private insurance

As discussed above, in Australia there are two health-care systems – public and private – with two associated health insurance systems.

Medicare

Medicare was launched in 1984 under the Hawke Labor government, and provided Australia's first universal health insurance scheme. The Medicare Benefits Scheme (MBS) provides free or subsidised services for a wide range of health services, practitioners and procedures, and is accessible for all Australians.

All Australian government funding for health services comes from general revenue (taxation), one part of which is notionally health related – the **Medicare levy**. The levy was introduced in 1984 and was originally set at 1 per cent of taxable income. It has increased several times, and in 2014 was 1.5 per cent of taxable income. In order to achieve greater equity, low income earners are exempt from paying the levy.

Medicare levy tax collected to fund Medicare

In October 1997, a further surcharge (the **Medicare levy surcharge**) of 1.0 per cent was levied on high-income earners who did not have private insurance cover for hospital care. The thresholds for the surcharge have been indexed over time. In 2012, legislation in the form of the *Fairer Private Health Insurance Incentives Act* introduced two levels of surcharge: individuals earning between $93 001 and $124 000 in 2011–12 paid a 1.25 per cent surcharge, and those earning $124 001 or more paid 1.5 per cent. The equivalent thresholds for families were $186 001 and $248 001. The aim of the surcharge is to encourage people to take out private health insurance.

Medicare levy surcharge extra tax taken from higher income earners

The Medicare Benefits Schedule (MBS) establishes a schedule of fees for medical services, which dictates the payments or rebate that the MBS contributes for those services. Practitioners are not obliged to adhere to the schedule fees, except in the case of participating optometrists and when practitioners bill Medicare directly, known as **bulk-billing**. For non-hospital services, Medicare pays up to 100 per cent of the schedule fee for GP consultations and up to 85 per cent for services provided by medical specialists. The patient is responsible for the gap between the benefit paid under the MBS and the schedule fee charged by the health practitioner.

bulk-billing the patient does not pay for the medical service; instead, the medical practitioner directly bills Medicare

Figure 1.45 Nurse conducting an MRI scan of a patient in a hospital

The **Medicare safety net** is a measure put in place to protect people from incurring higher than usual medical costs. An annual threshold of out-of-pocket expenses is determined, and if a single person or family reaches this threshold within a calendar year, then the rebate for out-of-hospital services increases to 100 per cent.

Medicare safety net a threshold that caps medical expenses annually

Medicare covers:

- 85 per cent of the MBS fee for out-of-hospital services provided by registered medical practitioners (GPs, specialists, x-ray, pathology)
- 75 per cent of the MBS fee for medical services provided in hospital
- 75 per cent of the cost for eye tests
- the full cost of accommodation and treatment by hospital-appointed doctors in public hospitals
- the full costs of x-rays and pathology tests
- 75 per cent of the in-hospital medical procedures performed by oral surgeons
- free out-patient servicing in some public hospitals.

Medicare does not cover:

- dental examinations and treatment
- private patient hospital costs
- ambulance and home nursing costs

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- physiotherapy and speech therapy
- podiatry and psychology
- alternative medicines – for example, homeopathic remedies
- glasses/contact lenses, hearing aids and medicines.

The Pharmaceutical Benefits Scheme (PBS) subsidises certain prescribed medications. The PBS was established in 1948 and is now administered by Medicare. The aim is to ensure all Australians have access to necessary prescription medicines. A further reduction is possible for those with concession or pension cards. A safety net for the PBS also exists, similar to the Medicare Safety Net. The PBS Safety Net provides free medications once the threshold is reached.

Private health insurance

As well as having access to the Medicare system, many Australians also have private health insurance. By the end of 2011, 10.4 million people (46 per cent of the Australian population) were covered by private health insurance, which was the highest coverage since 2001. There are two types of cover: hospital cover and extras cover (**ancillary cover**).

ancillary cover private health insurance cover for extras such as physiotherapy, dental and optical services

Hospital cover provides assistance in covering the costs of being treated as a private patient in a public or private hospital. Some benefits include avoiding public hospital waiting lists, choice of doctor or specialist and choosing to stay in a private room.

Extras or ancillary cover provides cover for services not covered by Medicare, including dentistry, physiotherapy, podiatry, remedial massage and optical services.

In an attempt to increase the number of people taking out private health insurance, the

Summary 1.34

1 Outline the range and types of health facilities and services in Australia.
2 Outline the various responsibilities of health facilities and services in Australia.
3 How equitable is access to health services in Australia? Provide examples.
4 How much money does Australia spend on health care?
5 Suggest what would happen if increased funding were directed towards early intervention and prevention.
6 What impacts are emerging new treatments and technologies having on health care?
7 What is Medicare?
8 How is Medicare funded?
9 What is the PBS?
10 What is the Medicare safety net?
11 How is private health insurance funded?
12 What are ancillary benefits?
13 What does private health insurance include?
14 What Commonwealth government incentives have been implemented to try to boost the number of Australians taking out private health insurance? Why is this seen as important?

Going further 1.33

Inquire

Read the article 'Reform health cover or collapse: Medibank warns government' on *The Australian*'s website (see www.cambridge.edu.au/hscpdhpe1weblinks).

1 How does private health insurance take the pressure off the public health-care system?
2 What are the benefits of having private health insurance?
3 What are the results of the recent changes in government rebates (from 30 per cent to means tested)?
4 Analyse the impact that a reduction in the number of people holding private health insurance could have on the public system.
5 Outline the changes that have been proposed to combat some of these issues.
6 Imagine you are 32, married and about to start a family. Compare a range of private health insurers to see what cover is right for you.
7 Are there any restrictions?
8 Do you think private health cover is worth the expense?

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Checklist 1.35

1 How equitable is the access and support available to all sections of the community?
2 How much responsibility should the community assume for individual health problems?
3 Describe the advantages and disadvantages of Medicare.
4 Describe the advantages and disadvantages of private health insurance.

Commonwealth government has introduced initiatives or incentives, including:

- a means-tested rebate for anyone with private health insurance (higher for over 65s)
- Lifetime Health Cover, which encourages people to take out private health insurance before age 30 to receive lower premiums.

In 2010–11, private health insurers offered rebates for a range of allied health services, including:

- 8.6 million physiotherapy services totalling $242 million
- 8.8 million chiropractic services totalling $214 million
- 8.0 million optical services totalling $524 million
- 28.4 million dental services totalling $1.6 billion.

The private health insurance system is a significant part of the health-care system in Australia, and provided $13.5 billion – almost 12 per cent of total funding – for health care in 2009–10. More than $9 billion of this came from insurance premiums paid by members, and the rest from government subsidies. The main beneficiaries of this are private hospitals, which receive almost half the total funding provided by private health insurers.

Complementary and alternative health-care approaches

Complementary and alternative medicine (CAM) covers a broad range of treatments and healing practices that traditionally haven't been viewed as part of conventional Western medicine. Many forms of these treatments and practices have existed for hundreds of years in the cultures in which they originated, and in more recent years have increasingly been used to support conventional medicines and therapies.

Reasons for the growth of complementary and alternative health products and services

Due to increased public health education and ease of access to information, Australians are now much more health-conscious and aware of the different treatment options available. In 2005, a survey of over 1000 Australian adults found that 68.9 per cent of those interviewed used at least one form of CAM and 44.1 per cent had visited a CAM practitioner. The estimated number of visits to CAM practitioners by adult Australians in a 12-month period was 69.2 million, which was almost identical to the estimated number of visits to medical practitioners (69.3 million). Australian research has revealed that females and those with higher levels of education are more likely to use CAM therapies.

There has been a significant increase in the use of CAM treatments in Australia in recent decades, which has been driven by increased globalisation, multicultural influences and social trends. The main reasons for the increased popularity of these therapies include the following:

- CAM therapies are promoted as a 'holistic' treatment.
- Increased choice of treatment options allows people to feel more in control of their health.
- High rates of migration to Australia have resulted in exposure to more traditional therapies.
- The WHO has endorsed the use of certain CAM treatments.

Figure 1.46 Acupuncture involves inserting very fine needles into the skin

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Figure 1.47 Chiropractic focuses on the nervous and musculoskeletal system and its association with the spine

- Conventional medicine has not proven effective for certain individuals or conditions.
- Many more training and study options in these therapies have led to a big increase in the number of practitioners trained in them.
- Many of these treatment options are designed to prevent illness, whereas conventional medicine is largely reactive and focused on treating illness.
- Improved access to information allows consumers to make an informed choice.
- There is recognition of the widespread use of CAM by the rest of the world.
- Greater regulation by government makes people more secure and confident.
- There is increased recognition of CAM from private health insurers.

Range of products and services available

CAM therapies are claimed to target a range of body systems in a number of ways. Common forms of CAM include:

- **Acupuncture** is based on ancient Chinese beliefs, and involves inserting very fine needles into the skin at certain points where the body's natural energy flows. Acupuncture is claimed to be effective for a range of conditions, including migraines and headaches, and joint and back pain.
- **Aromatherapy** uses essential oils, and claims to be a holistic treatment with benefits for both physical and emotional health. The essential oils can be used in massage, in baths or inhaled in vapour form.
- **Ayurvedic medicine** began in India 3000–5000 years ago and is a holistic system of healing. Using a range of natural remedies, including yoga, massage and herbal medicine, it seeks to promote healing within the body, preserve health and prevent disease.
- **Bowen therapy** is a form of physical treatment to the muscular and connective tissue in the body and claims to realign the body and stimulate energy flow. Bowen therapy is claimed to be effective in treating a range of musculoskeletal conditions, stress, arthritis and even sinus symptoms.
- **Chiropractic** is a physical treatment technique focusing on the nervous and musculoskeletal system and its association with the spine. It involves the adjustment and manipulation of joints in the spine to affect the nervous system, which is believed to provide health benefits to many parts of the body.
- **Herbalism** is based on the belief that humans have the ability to heal themselves. It involves the use of whole plants and herbs to form natural medicines that are used to support and replenish the body's healing mechanisms.
- **Homeopathy** is a treatment claimed to promote individual healing. It is based on the principle

that substances that cause symptoms in healthy people will cure similar symptoms in sick people. These substances are heavily diluted in water before being used to treat the individual. Scientific studies have repeatedly shown homeopathic remedies to be ineffective.
- **Naturopathy** is a holistic approach that claims to treat the whole person by harnessing the body's own processes, and its ability to heal and regulate itself. It is a non-invasive form of treatment, and encourages minimal use of drugs and surgery.
- **Osteopathy** is based on the principle that overall health is related to the functioning of the skeleton, muscles and connective tissue, and their ability to operate together efficiently.

How to make informed consumer choices

Despite increased public awareness and acceptance of CAM treatments, many treatment options that are promoted as cures lack any real evidence that they are effective. These services are often endorsed by people wanting financial gain, and are promoted as special offers or with money-back guarantees. Unfortunately, these services are often targeted at people who may have been experiencing long-term pain or ill-health, and are desperate for an improved quality of life.

Before seeking any type of health or medical treatment, it is important to ask the following questions:
- What qualifications and experience does the practitioner have?
- Is the practitioner a member of the Australian Natural Therapies Association?
- What is the evidence that the treatment offered is effective?
- Can it be used to complement conventional medicine?
- What is the cost of the treatment?

Regulation and standardisation of the various CAM therapies have always been issues, and for many of these therapies there is still no regulatory body in place. In a survey of over 3000 Australians, approximately half assumed that CAMs were independently tested by a government agency. This over-estimation of government monitoring may give CAM a legitimacy it has not necessarily earned, and imply that these treatments and therapies are effective and safe, regardless of their quality. More than half of CAM users do not inform their medical practitioner that they are using CAM therapies. It has been estimated that 50 per cent of CAM users use conventional medications on the same day as their CAM treatments, which may put these users at risk. Some CAM treatments involving the use of herbs, oils and supplements may interact with conventional medicines and can either increase or decrease their effectiveness.

Certain forms of CAM have been identified by the WHO to be effective and valuable treatments. These include acupuncture, chiropractic and osteopathy treatments – all of which have specific university courses dedicated to them. Many other forms of CAM therapy provide training courses for practitioners to be accredited; however, these courses are not at the university level and include natural medicine colleges and the Bowen Therapy Academy of Australia.

The Australian Natural Therapists Association has a list of all practitioners who are accredited and have signed a code of ethics. Members of the public should access this before selecting a CAM practitioner.

Summary 1.36

1 Outline the reasons for the growth in complementary and alternative health products and services.
2 Outline the range of products and services available.
3 How can one make informed consumer choices?

Checklist 1.37

1 How do we know who to believe when it comes to complementary and alternative health care?
2 What do you need in order to help you make informed decisions?

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1.4 The actions needed to address Australia's health priorities

Health promotion based on the five action areas of the Ottawa Charter

Driving question 1.38

Prevention is always better than cure. What are the affirmative and negative positions behind this statement? Relate your arguments to life in general as well as health.

There have been many changes over the past couple of decades regarding the way health promotion is approached. Many of these have been due to the increase in understanding of health itself, together with a recognition of the influence of external factors on an individual's level of health and the decisions they make about health. The Ottawa Charter was the product of the first International Conference on Health Promotion, which was held in Ottawa, Canada in 1986. The conference was held in response to the growing recognition of the need for a global health movement. The charter was developed using many different sources of information from around the globe, and built on principles that were developed through the Declaration on Primary Health Care at Alma-Ata, the World Health Organisation's *Targets for Health for All* document.

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

Levels of responsibility for health promotion

In order for health promotion to be effective, it must reflect the economic and cultural conditions of the community at the time, and should involve the full participation of all people from every sector of society. Responsibility for health lies with us all, and this is very clearly illustrated in the action areas of the Ottawa Charter. The five action areas of the Ottawa Charter advocate health promotion that engages individuals, communities and governments.

The function of health promotion is to empower individuals to take control of their health; clearly, therefore, an element of responsibility lies with individuals as they make decisions about their behaviours. However, it is widely acknowledged that there are many **determinants** that can have a significant impact on health, and on health-related decisions, so communities and governments have a role to play in creating an environment where good health is supported.

determinants factors that determine the health of an individual

Communities are involved in many health-promoting activities, from creating opportunities for physical activities such as walking groups and running club sports to community groups that target specific issues or groups – for example, a community support group for new mothers or recovering alcoholics. Community involvement is vital for effective health promotion.

National, state and territory and local governments all share responsibility for the promotion of health, with each tier of government being involved in different ways:

National governments

- development of national public health policy
- ongoing planning, monitoring, research and evaluation of public health activities
- provision of support for health initiatives in other states and provision of some support through funding
- partnerships with NGOs, state and territory governments and international organisations to develop policies and strategies to promote health and prevent chronic disease.

State and territory governments

- identification of statewide public health issues through **epidemiological** measures
- development and monitoring of strategies to address key health issues

epidemiology the branch of medicine that studies the causes, distribution and determinants of disease in a population

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- development of policies related to communicable diseases, environmental health, immunisation, food, workplace safety, water quality, drugs and emergency management
- development and monitoring of preventive and early detection programs such as cancer screening
- supporting population **health literacy** and health-promoting behaviours
- collaborating with all other government and non-government public health sectors and relevant authorities, to address public health issues.

health literacy the ability to access, read and interpret health-based information, and to then make an informed and relevant decision that supports and promotes good personal health

Local governments

- maintaining roads and local infrastructure
- recreational development and town planning that encourage a healthy lifestyle
- monitoring food safety, immunisation, sanitation and water quality
- managing community services
- addressing the specific health needs of the community through collaboration with Medicare Locals.

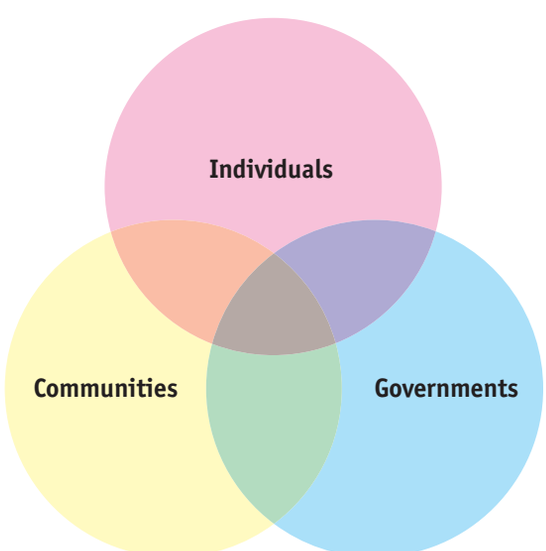

Figure 1.48 Responsible parties in health promotion

The benefits of partnerships in health promotion

Health-promotion campaigns and strategies are much more likely to produce positive results if an integrated and comprehensive approach is used to address the issues. This is very clearly reflected in the five action areas of the Ottawa Charter, and is an idea that has been reinforced by all subsequent global health conferences and charters from the WHO. As you have already discovered, the Ottawa Charter is a framework for health promotion that can be applied to all health-promoting agencies.

The design of the health-promotion emblem illustrates the integrated and complementary nature of the action areas. Encasing the emblem is a circle that represents building public policy. This illustrates the importance of government leadership in supporting and 'holding together' health promotion. When support for health promotion starts at a governmental level and the health of the nation is considered within all policy objectives, then societal health benefits are much more achievable. This was the key principle addressed at the 8th Global Conference on Health Promotion in Helsinki, Finland, from 10–14 June 2013. The conference identified that:

> Health in All Policies is an approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies, and avoids harmful health impacts, in order to improve population health and health equity. (WHO, see www.cambridge.edu.au/hscpdhpe1weblinks)

However, government policy must be reflective of the needs of the people, and react to changes within the population. This is represented through the wing of Strengthening Community Action and Develop Personal Skills, which breaks through public policy, illustrating the population's role in shaping policy and prompting health and the importance of a connection between government, NGOs, communities and individuals. The connection between governments and other bodies must enable and encourage participation. Participation and direction from communities lead to better health outcomes, as the needs of the community are more directly addressed, and increased participation leads to empowerment.

Also represented within the emblem are the other two action areas – Create Supportive Environments and Reorient Health Services – and the three basic strategies for health promotion – enabling, mediating and **advocacy** – which are integral to all forms of health promotion.

advocacy an action aimed at gaining support for a particular cause

If all action areas of the Ottawa Charter are represented in health-promotion strategies, there will be a much greater chance of reducing the number of people adopting poor health behaviours in the first place, and those already engaged in negative health behaviours will be supported and encouraged to stop.

An example of these principles in action is tobacco control in Australia. Significant decreases

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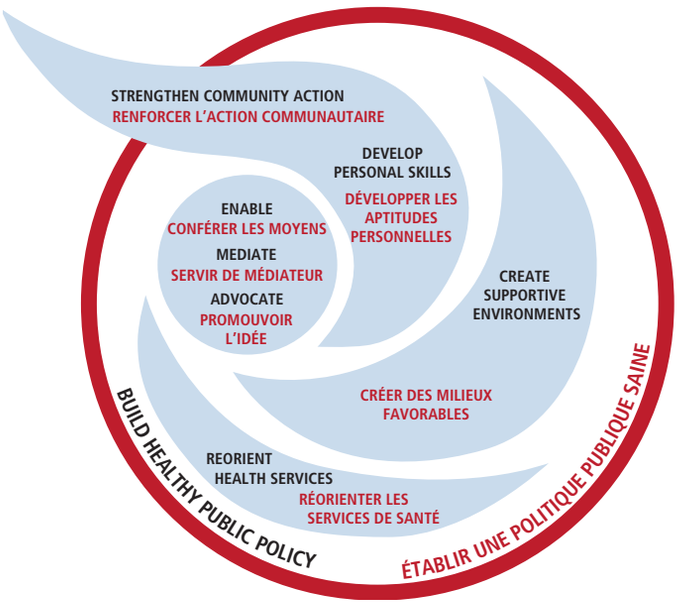

Figure 1.49 Health promotion emblem of the World Health Organization

in the rates of people smoking have been achieved over the past 30 years thanks to a comprehensive, multi-faceted set of health-promotion actions. These actions have extended across all levels of Australian society and involved all tiers of government, NGOs and communities. They have included changes in legislation, taxation and the regulation of tobacco sales, public education through mass media campaigns and school curriculum, research, increases in support for those wishing to quit through government and community-based initiatives and continual evaluation of programs. This coordinated and sustained approach has resulted in a change in public attitudes towards smoking and a subsequent change in behaviours.

There are many benefits of an inter-sectoral approach to health promotion, including the following:

- Sharing of resources, knowledge and expertise allows health issues to be addressed in a much more comprehensive way in the present and enables more effective planning for future issues.
- Health-promotion efforts are more sustainable as there is less duplication of effort.
- Many health issues are complex and affected by a number of determinants. Addressing issues from a number of directions means that contributing factors are more likely to be addressed than if one sector alone targeted the problem.
- Individuals and communities are empowered, and have a sense of ownership and control in health issues. A sense of control has been linked with higher levels of health.
- New and innovative ways of tackling old health problems are created.
- Involvement of communities and NGOs in lobbying for policy change means that policies will be reflective of the needs of the population.

How health promotion based on the Ottawa Charter promotes social justice

The principles of social justice are equity, diversity and supportive environments, and are at the core of effective health promotion. Health promotion aims to empower people so they can achieve good health. This involves identifying people who are experiencing lower levels of health and working to reduce the gaps.

Developing personal skills

Developing personal skills enables people to make more informed health decisions by improving their knowledge and skills. Access to education has been recognised by the WHO as a prerequisite for health, and therefore ensuring equitable access to quality education – regardless of income, location or circumstances – is vital for the principles of social justice to be upheld.

Developing an individual's health literacy empowers people to make informed choices about their health. An example is the PDHPE curriculum, which addresses a range of relevant health issues through classes and is available to all Australian children through schooling, which is provided free of charge.

The principle of diversity recognises that health-promotion strategies cannot be applied uniformly to all people, but must allow for differences in culture, religion, gender, education and socio-economic status. Programs aiming to develop skills and improve knowledge must be implemented in a way that is appropriate for the target audience. For example, variations of the *Australian Guide to Healthy Eating* have been developed specifically for Aboriginal and Torres Strait Islander peoples. These variations recognise the different food sources that are part of their diet and target specific nutritional issues within the Aboriginal and Torres Strait Islander populations.

If developing an individual's knowledge and skills allows them to take control of their health and make positive health choices, then they have the capacity to be a positive influence on the people around them. For example, a mother who has been educated about the importance of a balanced diet is

more likely to provide healthy food for her children and to pass on her knowledge.

Creating supportive environments

An environment in which healthy choices are supported and encouraged is much more likely to produce positive health outcomes for the people that live in it.

For example, a local pool in a community with a high proportion of Muslim women designates several timeslots each week to women-only swimming sessions and learn-to-swim classes. This recognises the diversity of the population and allows for equitable access to health facilities by removing some of the barriers that may have been stopping these women from using the pool and engaging in physical activity. This creates an environment that is supportive of healthy lifestyle choices and may assist in reducing illnesses that are associated with low levels of physical activity such as overweight and obesity.

Strengthening community action

The most effective health-promotion strategies are those that directly involve the community. Consulting with communities in the development of health-promotion activities means that the specific needs of the community are more likely to be met. Community involvement in the implementation of the strategies is also important, and gives a greater sense of control.

For example, one of the key elements in the Close the Gap campaign targeting the health inequities experienced by Aboriginal and Torres Strait Islander peoples is the involvement of Indigenous peoples, communities and services in all stages of strategy development. Many of the strategies within the campaign have been developed to be run by existing Aboriginal and Torres Strait Islander health services, and to train Aboriginal and Torres Strait Islander peoples so they are directly involved in all aspects of development and implementation.

Reorienting health services

Reorienting health services seeks to move away from a traditional curative view of health to integrate health-promotion and preventative strategies into all aspects of health care, and to provide services that reflect the diverse nature of our society – for example, delivering health services that are culturally sensitive, such as through a women's health clinic. It means supporting positive health choices through education and promotion of preventative strategies – for example, pap smears. It also involves recognising that by influencing a person's health-related choices, a health practitioner may be more effective in addressing their health needs.

Building healthy public policy

As reflected in the emblem of the Ottawa Charter, building healthy public policy encapsulates all other aspects of health promotion. Through funding, legislation and policies, governments can create an environment that achieves equity and good health for all. Some examples include:

- Equitable access to health care is made available through the Medicare and the PBS.
- Education is provided to all children free of charge through the public schooling system, promoting the development of knowledge and skills.
- Governmental assistance is provided to those who experience financial hardship through avenues such as Centrelink.
- Laws against discrimination protect the diversity of the Australian people.
- Workplace regulations and policies such as work health and safety (WHS) policies protect the health and safety of workers.
- School policies such as zero-tolerance policies for bullying protect the health of students.
- Government legislation such as smoking restrictions support people in making positive health choices.

As mentioned earlier in the chapter, it is important that there is collaboration in the development of policies and legislation, to ensure that the policies change with the needs of the population.

The Ottawa Charter in action

The Ottawa Charter is such a comprehensive and well-coordinated approach to health promotion that, if implemented well and in its entirety to address a health issue, then positive change is inevitable. Health action based on the Ottawa Charter is likely to bring about positive health outcomes because it addresses health issues from a variety of angles, and includes all levels of government and society.

NSW Tobacco Strategy 2012–17

Huge progress has been made in the area of tobacco control in Australia, thanks to growing action against smoking. Anti-tobacco strategies have been implemented that incorporate all levels of society. The NSW Tobacco Strategy 2012–17 is one of these strategies, and provides a very clear

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example of the principles of the Ottawa Charter in action. The aims of the strategy are to:

- reduce the number of people using tobacco
- prevent the uptake of smoking, especially by children and young people
- prevent exposure to second-hand smoke and the harm it causes
- reduce smoking among Aboriginal and Torres Strait Islander people and other disadvantaged populations
- decrease tobacco-related death and disease.

The strategy has not been developed in isolation, but has been informed by national, international and state policies and frameworks, including the WHO Framework Convention on Tobacco Control at the international level, the National Partnership Agreement on Preventive Health and the National Partnership Agreement on Closing the Gap in Indigenous Health Outcomes at the national level, and the NSW 2021 Plan, the NSW Cancer Plan 2011–15 and the NSW Tobacco Action Plan 2005–09 at the state level. At the heart of the strategy is the acknowledgement that tobacco control must involve people at all levels.

As can be seen from the figure below, the strategy addresses each of these aims through many different health-promotion activities that are implemented via different agencies, including:

- NSW Health, including the NSW Ministry of Health
- Local Health Districts, Justice Health and Multicultural Health Communication Service
- Cancer Institute NSW
- NSW Department of Education and Communities
- NSW Department of Premier and Cabinet (Division of Local Government)
- Corrective Services NSW
- Community Services.

Partnerships with other agencies will also play a significant role in the delivery of the strategies; these include:

- Cancer Council NSW
- National Heart Foundation (NSW Division)
- Aboriginal Health and Medical Research Council
- NSW Quitline
- Aboriginal and Torres Strait Islander communities and health organisations
- GP divisions
- Medicare Locals
- Commonwealth government
- local councils
- state and private schools
- Catholic and independent schools
- universities and research groups
- consumer and media organisations.

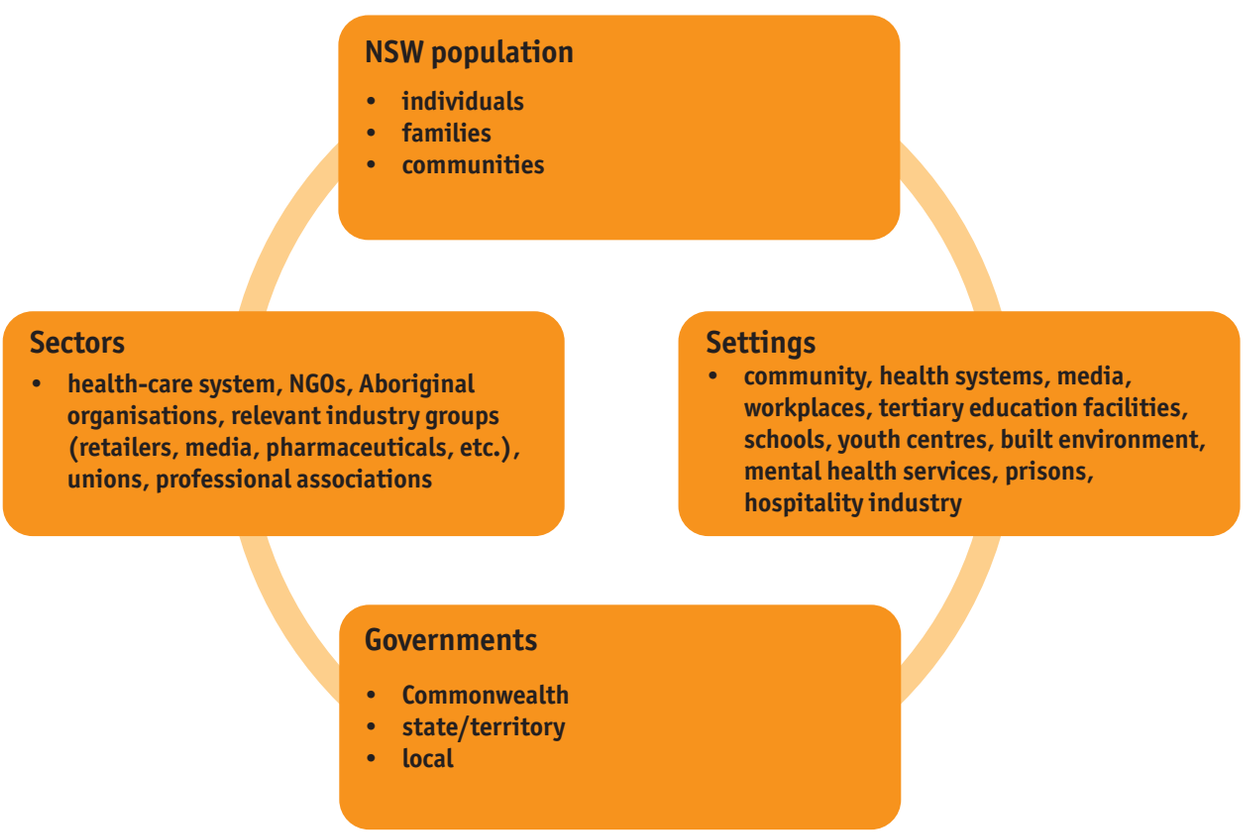

Figure 1.50 NSW tobacco control strategy

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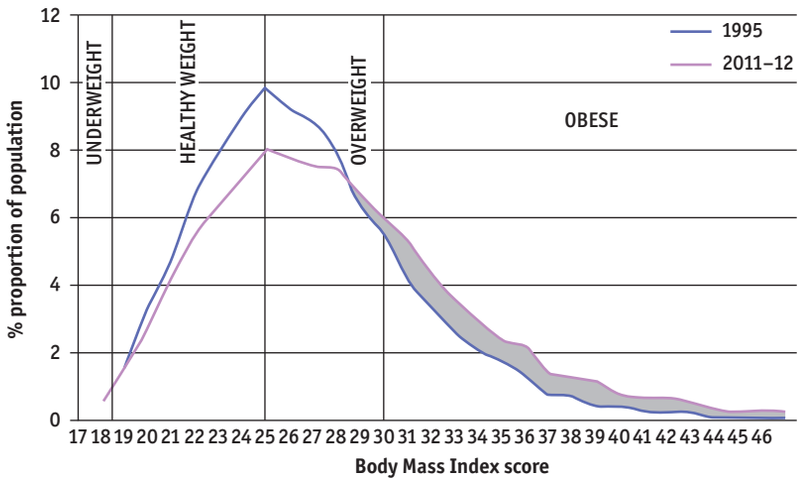

Note: Shaded area depicts the increase in proportion of population that is obese
Source: ABS[11]

Figure 1.51 Body Mass Index Distribution, persons 18 years and over, 1995 and 2011–12

Source: State of Preventive Health 2013, p. 47.

The strategy is divided into eight priority areas, which have been based on best-practice approaches to health promotion. Table 1.14 on pages 68–9 identifies the priority areas, specific strategies within the priority areas and the Action area of the Ottawa Charter that is represented.

Shape Up Australia, 2013–14

Before the announcement of the 2014 federal budget, Shape Up Australia was a new government initiative targeting behaviours that contribute to conditions like overweight and obesity, diabetes and CVD. The initiative built on the health movement started in the previous Measure Up and Swap It, Don't Stop It campaigns. While it is now defunct, it still provides a good example of a health-promotion strategy based on the Ottawa Charter.

The core element of the Shape Up Australia initiative was partnerships. The initiative sought to partner with organisations to support healthy lifestyle choices to provide a united and coordinated approach to obesity prevention and reduction of related diseases.

The initiative had several different elements to it, and can be used as a case study showing the Ottawa Charter's multi-sectoral approach to health promotion.

Going further 1.39

Create

1 The My Quit Buddy app won the award for Best App at the 2013 Australian Mobile Awards. Have a look at the main features of the app shown on the right or by looking at the app on the app store. Evaluate how effective you think this app would be in assisting someone to quit.
2 In what ways do you think it would be more effective than some of the more traditional quit methods?
3 Select one of the other major health issues in Australia and design an outline of an app that would help someone modify risk behaviours associated with that issue.

Figure 1.52 The My Quit Buddy app

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The main aims of the initiative were to:

- improve the health of Australians by supporting healthy lifestyle choices
- support the maintenance of a healthy weight for all Australians
- prevent unhealthy weight gain
- reduce the cost of weight-related conditions to the Australian community.

Developing personal skills

As part of the strategy, a website was developed that provided tools to assist people to lose weight. It provided education about:

- the dangers associated with excess weight gain
- self-measurement guides to determine whether you are overweight and at risk
- specific guidelines and information sheets on a number of specific topics, including:
  - How to Stay on Track When Eating Out
  - The Bloke's Guide to Shaping Up
  - What's in Season, Eating Fresh
  - Healthy Eating, Shape Up with a Healthier Diet
  - Shape Up, a Guide for Health Professionals
  - Portions, Shape Up with Smaller Portions
  - Thinking About Kilojoules, Only Eat What You Need
  - Rethink Sugary Drink, Would You Eat 10 Teaspoons of Sugar?
  - Shaping Up on A Budget
  - Healthy Weight Tips for 35+ Year Olds
- resources from the Swap It Don't Stop It campaign, which ran from 2011–13, including an app to assist people to swap unhealthy behaviours for healthy ones.

Figure 1.53 Shape Up Australia was an initiative that promoted healthy lifestyle choices

These resources provided clear, easy-to-understand advice, supported by such things as recipes, pantry planning guides, exercise suggestions and 12-week planning guides to support healthy changes.

In addition, the use of a national branding system would help Australians to more easily identify credible, evidence-based obesity-prevention and healthy lifestyle information, services and programs. This would support people as they attempted to change their behaviours, and would keep the message of obesity prevention at the forefront.

Strengthening community action

Through the initiative, the government was looking to partner with organisations and communities that promote behaviours that will maintain a healthy weight, keep people active and decrease the prevalence of lifestyle-related chronic disease.

Organisations that partnered in the initiative would have been able to use the Shape Up Australia brand to raise awareness of their services, resources and programs.

The organisations that were eligible to apply to partner in the Shape Up Australia initiative included:

- Australian government agencies
- state/territory and local government agencies
- public health non-government organisations
- Medicare Locals
- community-based health-promotion organisations.

Organisations that weren't eligible to carry the Shape Up Australia brand include manufacturers and retailers of branded food products, commercial gyms and fitness trainers, and suppliers of commercial weight-loss products, programs or equipment.

Some of the benefits to organisations that decide to partner included:

- the ability to use Shape Up Australia messaging and resources
- cross-promotion opportunities, such as promotion of their activities through the branding partner page of the website
- national Shape Up Australia public relations and promotional activities aimed at building brand recognition and trust, and steering consumers towards Shape Up Australia services and programs.

This part of the initiative would have been effective, as it sought to unite and produce a more coordinated approach to obesity prevention and the improvement of lifestyle behaviours for Australians. The strategy sought to more effectively

Priority area	Example strategies
Public education Continue and build on public education campaigns to motivate smokers to quit	Build on mass media campaigns with strong anti-tobacco messages that are relevant, motivational, frequent and have a high impact through a variety of mediums.
	Develop public education campaigns aimed specifically at Aboriginal and Torres Strait Islander smokers using adaptations of mainstream campaigns.
	Use social media and online advertising in innovative ways to encourage quitting and support attempts to quit.
Cessation services Continue to provide evidence-based cessation services to support smokers to quit.	Promotion of support services to help people quit and stay smoking-free. Services include NSW Quitline, iCanQuit website and specialised cessation services, brief interventions provided by health professionals, community groups and workplace programs.
	Increase knowledge of pharmacotherapies.
	Improve integration between services such as Quitline and primary health services.
	Train health professionals and health workers in best practice regarding quit smoking support.
Aboriginal communities Work in partnership with Aboriginal communities and peak bodies to reduce smoking and exposure to second-hand smoke among Aboriginal people.	Provide training to Aboriginal health workers in the delivery of quit smoking programs.
	Partner with Aboriginal community-controlled health organisations in developing policies, and implementing and evaluating programs.
	Include brief interventions as part of routine health service delivery to Aboriginal people.
Groups with high smoking prevalence Strengthen efforts to reduce smoking among people in low-SES and other groups with high smoking prevalence, such as some culturally and linguistically diverse groups.	Promote anti-smoking messages and cessation assistance among low SES groups and provide additional support where required.
	Increase referrals from GPs in low-SES areas to Quitline and other quit services.
Tobacco advertising and promotion Regulate the advertising and promotion of tobacco products and restrict the availability and supply of tobacco, especially to children.	Enforce the requirements of the *Public Health (Tobacco) Act 2008*.
Second-hand smoke Strengthen efforts to reduce exposure to second-hand smoke in workplaces, public places and other settings.	Continue to implement smoke-free policies and amend the *Smoke-free Environment Act 2000* to prohibit smoking within 10 metres of children's play equipment, in open areas of public swimming pools, in sporting facilities, at public transport stops, within 4 metres of a public building entrance and in commercial outdoor dining areas.
Young people Strengthen efforts to prevent young people taking up smoking.	Continue to deliver education about the harmful effects of smoking through school curriculum.
Research, monitoring, evaluation and reporting Strengthen research, monitoring, evaluation and reporting of programs for tobacco control.	Continue to strengthen the monitoring of current anti-tobacco strategies, evaluating and improving as necessary.

Table 1.14 Ottawa Charter priority areas, strategies and action areas of the NSW Tobacco Strategy 2012–17

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	Ottawa Charter	Reason for effectiveness of the strategy
	Developing personal skills	There is strong evidence of the effectiveness of public education campaigns in reducing smoking. By making anti-smoking messages relevant and personal, behaviour change is more likely to be achieved. Smokers are bombarded with reminders of the dangers of smoking and the need to quit, as are their family and friends. This is more likely to increase the chance of them quitting.
	Developing personal skills	Aboriginal and Torres Strait Islander people are more likely to listen and respond to quit messages that are delivered through members of their own community. Developing strategies with Aboriginal and Torres Strait Islander people removes cultural barriers.
	Developing personal skills	Saturation of the anti-smoking message.
	Developing personal skills Creating supportive environments Strengthening community action Reorienting health services	Reinforce messages being sent through media campaigns and provide valuable support to those who take the step to quit. Practical strategies and self-help techniques can be accessed through the websites, which can help smokers overcome temptation.
	Reorienting health services	Can greatly assist people who are highly dependent smokers to overcome cravings and temptations.
	Reorienting health services	Smokers will be supported by health professionals as they attempt to quit. Will assist in the management of existing health conditions.
	Reorienting health services	Brief interventions through GPS and other health care services have been found effective in assisting people to quit.
	Reorienting health services	Aboriginal and Torres Strait Islander peoples are more likely to listen to advice provided by members of their own community.
	Strengthening community action Reorienting health services	Cultural barriers in the implementation of programs will be reduced as they are being developed in conjunction with Aboriginal and Torres Strait Islander peoples.
	Reorienting health services	Aboriginal and Torres Strait Islander clients will be asked about smoking status as a regular part of a health consultation. Immediate assistance and support for cessation programs can be provided as required.
	Developing personal skills Creating supportive environments	Barriers to accessing support may be removed.
	Developing personal skills Reorienting health services	Partnership between GPs and Quitline will strengthen the support provided to quitters.
	Building public policy	Limiting the availability of tobacco products will make it harder for smokers to maintain the habit and for young people to access tobacco. Prosecutions for illegal sales mean that businesses are more likely to comply with regulations. Limiting the display of tobacco products and advertising has been shown to change children's perceptions of smoking.
	Building public policy	Smoke-free environments assist in 'denormalising' smoking, support smokers' efforts to quit and protect people from second-hand smoke.
	Developing personal skills	Eighty per cent of current smokers began smoking under the age of 20 and the younger they are when they start the more likely they are to never stop. Targeting youth behaviours and stopping young people ever starting smoking will be a great step in reducing rates of smoking.
	Strengthening community action	Programs of best practice will be delivered and strategies improved.

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utilise health-promoting organisations that are already operational, and endorse their services. By using a national brand, people would have been able to easily identify organisations that provide credible and reliable health information and health-promoting services.

Creating supportive environments

As mentioned previously, the strategy aimed to unite services that target obesity and provide a national brand that people could easily identify as a credible and reliable source of health information and services. The involvement of communities, Medicare Locals, local and state governments and other health-promoting organisations meant that the programs being implemented were more likely to be targeted specifically to the needs of the population. Tools to support shaping up were readily available, and the app meant that people could be provided with information and support wherever they are.

Reorienting health services

Partnerships with GPs and other health-care providers were also being strengthened through the campaign. Quick reference guides were provided for health professionals so that at-risk patients could be identified easily and quickly. The strategy also promoted the related MBS items, such as the:

- 45-year-old health check
- type 2 diabetes risk evaluation
- adult health check
- Aboriginal or Torres Strait Islander Health Checks (15 years and older)
- health assessment for refugee and other humanitarian entrants.

In addition, it aimed to identify health problems early on so preventative action could be taken. By encouraging health professionals to make weight and waist measurements a part of every check-up, people were constantly being reminded of the importance of maintaining a healthy weight.

Building public policy

The Shape Up Australia campaign was developed by the Australian National Preventive Health Agency, which was established on 1 January 2011, following the commencement of the *Australian National Preventative Health Agency Act 2010*. This strategy was part of a national approach to tackle obesity and related behaviours in Australia. Government involvement and partnership will mean that obesity remains at the forefront of the government's agenda.

Summary 1.41

1 What are the levels of responsibility for health promotion?
2 Discuss the benefits of partnerships in health promotion.
3 Outline how health promotion based on the Ottawa Charter promotes social justice.

Going further 1.40

Create

Research the following strategies and evaluate how they are being used to tackle problems of overweight and obesity-related conditions such as diabetes and CVD:

- subsidised lifestyle modification programs
- development of frameworks for monitoring television marketing and advertising to children of unhealthy food and drinks
- Get Healthy Information and Coaching Service®
- It's Your Move campaign – ACT
- changes to food labelling laws in Australia.

Checklist 1.42

1 What are the benefits of health promotion based upon individuals, communities and governments working in partnership?
2 What are the benefits of health promotion based on the five action areas of the Ottawa Charter?
3 Investigate the principles of social justice and the responsibilities of individuals, communities and governments under the action areas of the Ottawa Charter.
4 Critically analyse the importance of the five action areas of the Ottawa Charter to a health-promotion initiative relating to a health priority.

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Chapter summary

- Compared with other OECD countries, Australians have above-average rates of employment, education and disposable income. This is counterbalanced by the fact that Australians work much longer hours than the OECD average.
- The collection of health data is known as epidemiology, which is the study of health and disease in a population over time. Epidemiology shows prevalence, incidence and potential causes of disease.
- The accuracy and usefulness of epidemiology rely on the quality of the data collected. Poor-quality data can arise from insufficient sample sizes, unreliable collection methods, lack of standard measures and multiple sources of information.
- The mortality rate, an important epidemiological measure, is defined as the number of deaths from a specific cause or in a specific population over a period of time (usually one year).
- Infant mortality is an important indicator of the general health and well-being of a population. Infant mortality rates among Indigenous Australians are significantly higher than those of the general population.
- Morbidity, another important epidemiological measure, is defined as illness, injury and disease that does not result in death. Relying on prevalence and incidence data, the morbidity measure gives a fuller picture of the health of a population compared with mortality rates.
- The rise in the life expectancy of Australians over the twentieth century can be attributed to many factors, including improvements in medical knowledge and treatment technologies, reduced smoking rates, improvements in hygiene and sanitation, improved working conditions and better health education.
- Addressing inequity in health outcomes is an important issue of social justice.
- Cardiovascular disease, cancer, diabetes, mental health, asthma and injury are the most prevalent causes of mortality and morbidity in Australia.
- Indigenous Australians experience significantly greater rates of ill-health and premature death than other Australians. The Closing the Gap campaign is an attempt by the Australian government to reduce these rates.
- The 29 per cent of Australians living in rural areas and the 3 per cent of Australians living in remote areas experience a range of health inequities due to their remoteness from health facilities and limited access to goods and services.
- The proportion of Australians who are 65 years or older has nearly doubled since the 1970s – a trend that will continue. Although many older Australians are very energetic participants in society, the natural increase in conditions such as dementia, heart disease, stroke and cancer in individuals over the age of 65 puts pressure on the Australian health-care system. This means that the concept of healthy ageing has become a government priority.
- People with disabilities struggle to achieve the same health status as the general population, and as a population suffer higher rates of asthma, cancer, cardiovascular disease, diabetes, arthritis, osteoporosis, injury, distress, anxiety and other mood disorders.
- Leading causes of death in Australia are cardiovascular disease, skin, breast and lung cancers, diabetes, respiratory disease and injury.
- Mental illness affects a significant proportion of the population, with one in five Australians experiencing a mental illness in any one year.
- The responsibility for the maintenance of the health-care system is split between the Commonwealth, and the state and territory governments. Private health-care services are provided by a range of private and community groups.

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Chapter summary (continued)

- Medicare, Australia's national health-care system, provides access to health services by providing either subsidised or free treatment for a range of health issues. The Pharmaceutical Benefits Scheme (PBS) subsidises certain prescription medications, making expensive but vital medication available at a reasonable cost.
- Over 90 per cent of Australia's recurrent health-care spending is allocated to the treatment of ill-health and disease, with only a small percentage allocated to services and initiatives targeting early intervention and prevention.
- Many new medical technologies, such as keyhole surgery, ultrasounds, CT and MRI scans, have led to significantly better health outcomes for Australians. However, these technologies come at a high cost, and health administrators must analyse the costs and benefits of these technologies before investing.
- The increase in public health education and access to information has led to more and more Australians visiting complementary and alternative medicine (CAM) practitioners. Some of the most popular of these therapies are acupuncture, aromatherapy, ayurvedic medicine, Bowen therapy, chiropractic, homeopathy, naturopathy and osteopathy. However, some of these treatments lack reliable evidence that backs up their claims. It is important to inform yourself well before undergoing CAM.
- The Ottawa Charter, an international health-care agreement, advocates health promotion that engages individuals, communities and governments. The New South Wales Tobacco Strategy 2012–17 is an extremely clear example of the principles of this charter in action.

Multiple-choice questions

1 **Epidemiology measures:**

A health status, hospitalisation data
B mortality, infant mortality, morbidity, life expectancy
C morbidity, education, medical advancements
D injury incidence, disease prevalence, work ethics

2 **National Health Priority Areas (NHPAs) include:**

A cardiovascular health
B diabetes mellitus
C arthritis and musculoskeletal conditions
D all of the above

3 **DALY stands for:**

A diabetes awareness life years
B diabetes adjusted life years
C disability adjusted life years
D disability awareness life years

4 **Priority population groups in Australia include:**

A Indigenous people, prisoners, overseas-born people
B veterans, people in rural and remote areas
C socio-economically disadvantaged people
D all of the above

5 **The results of the 2007–08 National Health Survey indicate a high prevalence of chronic diseases among Australians, including:**

A cancer, obesity, schizophrenia
B long-term mental or behavioural conditions, arthritis, conditions of the circulatory system
C diabetes, asthma, jaundice
D heart disease, vision impairment, cancer

6 **Which of the following is not associated with an increased risk of developing diabetes?**

A a high rate of alcohol consumption
B a high rate of physical activity
C high sugar intake
D a light smoking habit

7 **The symptoms are tightening of muscles around the airway, inflammation and reddening of the airway and the production of extra mucus. What is the likely medical condition?**

A asthma
B diabetes

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Multiple-choice questions

C eczema
D pruritus

8 **Which of the following scenarios reflects the expected makeup of Australia's society in 2031?**
A a large working pool supporting a small number of pensioners
B an increase in the number of people requiring informal care, a decline in the number of carers
C a lower average life expectancy
D a lower proportion of Australia's GDP going towards pension payments

9 **Increasing tax on cigarettes reflects which action area of the Ottawa Charter?**
A developing personal skills
B creating supportive environments
C building healthy public policy
D reorienting health services

10 **Acupuncture uses what to treat the body?**
A essential oils
B whole plants and herbs
C fine needles
D yoga and massage

Exam-style questions

1 What are the benefits and limitations of epidemiology?
2 How do we identify priority health issues for Australia?
3 Justify the inclusion of cancer as a priority health issue.
4 Outline the nature and extent of the health inequities experienced by two groups in Australia.
5 Describe the roles that individuals, communities and governments have in addressing health inequities experienced by Aboriginal and Torres Strait Islander peoples.
6 Discuss the determinants that impact on lung cancer.
7 What is healthy ageing, and what impact may it have in the future?
8 Assess the impact of a growing and ageing population.
9 Justify an increase in health-care expenditure being directed into early intervention and prevention.
10 Compare the advantages and disadvantages of Medicare and private health insurance.
11 Outline the reasons for the growth of complementary and alternative health products or services.
12 How would a consumer make an informed choice about choosing a health-care provider?
13 Argue the benefits of individuals, communities and governments working in partnership.
14 How does health promotion based on the Ottawa Charter promote social justice?
15 Apply the Ottawa Charter to a health-promotion initiative.

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Chapter 2 Factors Affecting Performance

HSC Core 2

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

- *the effects of training on performance*
- *the impact of psychology on performance*
- *the effects of nutrition and recovery strategies on performance*
- *the impact of the acquisition of skills on performance.*

Key terminology

adenosine triphosphate (ATP)
atrophy
cardiac output
concentration
continuous training method
extrinsic motivation
fartlek
fast-twitch muscle fibres
glycogen
glycolysis
goal-setting
haemoglobin
imagery
intrinsic motivation
kilojoule (kJ)
lactate
lung capacity
lysis
mechanical energy
muscle fibres
muscle hypertrophy
negative motivation
oxygen uptake
positive motivation
pyruvate
relaxation
resting heart rate
resynthesis
VO_2 max

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2.1 The effects of training on performance

Driving question 2.1

Select a sport and list all of the training activities involved in a typical week.
For each training activity, identify the primary reason for this activity in relation to their competitive performance.

Energy systems

Going further 2.2

Communicate

As a class, discuss the following questions.

1 If cars use petrol for fuel, what is the source of the fuel used for human movement?
2 If you started sprinting and continued for as long as you could, how long could you last? What causes you to slow down or stop?
3 If you started jogging at a slow pace, and you didn't stop until you collapsed, what would cause this?
4 Discuss the phenomenon of fatigue, and examine the different ways in which people experience it. Is it more mental or physical? What do you think causes fatigue?

The living human body is a complex machine, consisting of a number of interdependent body systems (such as the cardiovascular, digestive and muscular systems), carefully organised to produce an amazing system characterised by balance – the ability to sustain itself and produce vast amounts of mechanical and intelligent output. All of these functions require a constant source of energy or fuel to enable each cellular process.

It could simply be assumed that the food we eat is directly responsible for providing the vast energy needs of an active human being. Carbohydrates are often described as the body's best fuel source; however, this is a very limited understanding of the body's energy supply.

Consider a house, with its many power outlets and electrical devices. Each appliance has a unique function; however, a consistent energy source is needed to enable the use of all of them. Likewise, the human body has a range of specialised cells and organs, such as the heart, brain, digestive system and muscles, each of which carries out a unique function. The fuel or energy source for all of these separate organs and bodily functions is stored within the high-energy chemical bonds that join atoms together within a particular molecule known as **adenosine triphosphate (ATP)**. As these bonds are broken, energy is released for cellular function, including the contraction of a muscle cell for the sake of movement. Compared with the equivalent energy value of food in its eaten form, this is a much lighter, smaller and more efficient form of fuel storage. During a marathon, the total weight of the molecules used to fuel the movement is almost the same as that of the person themselves. Obviously the runner does not store twice their body weight in fuel prior to a run, which demonstrates the unique way in which the body

adenosine triphosphate (ATP) high-energy compound that is the basic source of energy for the functions of cells, such as a muscular contraction

Nutrient	Food example	Basic form	Stored form	Stored location and amount	Energy value per gram
Carbohydrate	Bread, rice	Glucose	Glycogen	Blood 20 g Muscle 500 g Liver 100 g	17kJ
Fats	Olive oil, butter	Lipids	Triglycerides	Adipose tissue (body fat) 12 kg+ Muscle triglyceride 300 g	37 kJ

Table 2.1 Nutrient values, forms and locations

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converts energy from food into stored energy for living and exercise.

It is worth noting that there is a change in the form of energy when the body produces movement. The basic energy provided through foods such as carbohydrates and fats is known as chemical energy (measured in **kilojoules** or calories). The body uses chemical-based energy systems to fuel muscular contractions, and **mechanical energy** is created as the body produces movement. These nutrients undergo a series of chemical reactions to break them down into a form suitable for short- to long-term storage.

kilojoule (kJ) a measurement of energy (sometimes called a calorie, which is equal to 4.2 kJ)

mechanical energy energy involving movement or motion

Protein also has an energy value, and is broken down into the form of amino acids, which are used to repair and form new body tissue where necessary. However, the use of protein as an energy source generally only occurs during extreme circumstances, such as a famine, when all other stores are exhausted. Where excess protein is consumed, it is converted into triglycerides, which can easily be stored by the human body as excess body fat or adipose tissue (stored under the skin).

As mentioned earlier, the primary source of the body's energy lies within the high-energy covalent bonds of a unique molecule known as adenosine triphosphate (ATP). This molecule is present in every living human cell, and it powers the individual functions of each cell.

Adenosine triphosphate, as the name suggests, is a molecule that contains an adenosine nucleotide attached to three phosphate groups. The bonds between these are high-energy covalent bonds that, when broken down (known as hydrolysis), release energy for muscular contraction (and the rest as heat). This process is outlined in the diagram on this page.

Interestingly, the human body only has enough ATP to survive for approximately 10 seconds, and less if it attempts to produce intense movement (2–5 seconds). It is estimated that in our entire body there is approximately 70 grams of ATP (which equates to trillions of ATP molecules). During a marathon, the body will require over 50 kilograms of ATP. A similar amount is needed to power an adult through a regular day.

So how is it possible to use the equivalent of over half our body weight in energy in a single day if we have such a small and limited supply? This is where the stored fuel or energy reserves in the body are efficiently utilised to power the resynthesis of ADP into ATP. There are three distinct energy pathways

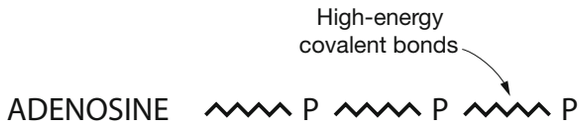

Figure 2.2 ATP structure – a molecule that contains an adenosine nucleotide attached to three phosphate groups. Each phosphate group is joined by a high-energy covalent bond

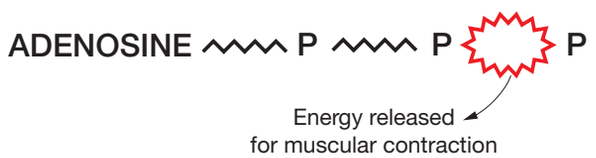

Figure 2.3 ATP breakdown and energy release – as the bond between the second and third groups is broken, energy is released for muscular contraction

Figure 2.4 ADP + P – the result is adenosine diphosphate (an adenosine nucleotide joined to two phosphate groups) and a spare phosphate molecule. These are both relatively useless, until the ADP is resynthesised back into ATP

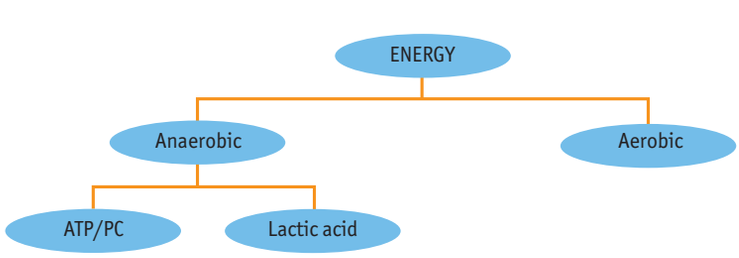

Figure 2.1 Overview of the three energy pathways that fuel the resynthesis of ADP into ATP

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glycolysis the breakdown of glucose for fuel – **lysis** is the breakdown or decomposition of a cell or substance

anaerobic pathways chemical pathways that function in the absence of oxygen

aerobic pathways chemical pathways that function in the presence of oxygen

resynthesis to recombine broken and separated components back together in their original form

or systems that are used to ensure the body is never depleted of its ATP stores:

- phosphocreatine system (ATP-PC)
- anaerobic **glycolysis**
- aerobic energy system.

Each energy system plays a unique role in helping the body to have sufficient ATP molecules and energy at various intensities and duration of activity. The first two pathways are unique, as they function in the absence of oxygen – otherwise known as an **anaerobic pathway** – whereas the third system relies on the presence of oxygen, and is therefore known as an **aerobic pathway**. It should be noted that these three systems do not work independently of and exclusively from each other, but as a coordinated response of all energy pathways, working together to varying degrees to supply ATP at different intensities of effort.

Alactacid system (ATP/PC)

The initial system used to **resynthesise** ATP is called the phosphocreatine system. This is commonly abbreviated to ATP-PC. Other names for this are the creatine phosphate system or the alactacid system.

The energy from this system is stored within the high-energy bond that joins a creatine and phosphate molecule together, called phosphocreatine (PC). As the bond between these is broken, energy is released to help rejoin a spare phosphate group to an ADP molecule. This process is outlined in the figures on this page.

The ATP-PC system's greatest advantage is the speed at which it can provide energy for ATP resynthesis. During maximal activity, where ATP stores can be depleted in less than five seconds, this is an essential characteristic of the ATP-PC system. However, the shortfall of this is that only a limited supply of PC can be stored within the muscle cells of the body. Therefore, maximal and high-intensity activity can only be sustained for five to 10 seconds before PC stores are depleted. PC is the dominant energy source for the first five seconds, after which the second energy system has been activated and is starting to supply energy to resynthesise ATP. After the PC stores are exhausted, two to three minutes' rest is required to fully replenish the PC stores.

Figure 2.5 Sprinters focus their training on the development of the ATP-PC system

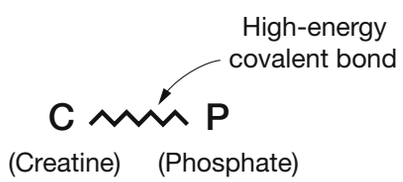

Figure 2.6 Phosphocreatine is a molecule consisting of a creatine and phosphate group, joined by a high-energy bond

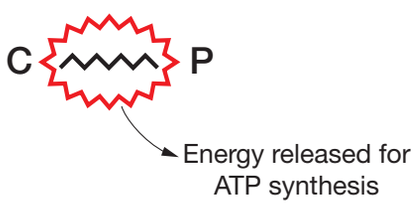

Figure 2.7 When ATP needs to be quickly resynthesised, an enzyme named creatine kinase breaks down the PC bond

Figure 2.8 This energy is used to help join the spare phosphate group from the PC, on to a free ADP molecule

Figure 2.9 The result is a new ATP molecule, ready to provide ongoing energy for muscular contraction

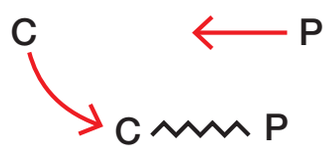

Figure 2.10 The broken creatine and phosphate groups will then be resynthesised in a matter of minutes when resting, creating an ongoing cycle of energy use and restoration

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Syllabus point	Characteristic of energy system	Description
Source of fuel	Phosphocreatine (PC)	The energy is stored within the bond of the PC molecule. As it breaks, energy is released.
Efficiency of ATP production (speed of production and amount of ATP resynthesised)	Very fast 0.7 ATP per reaction	Instant supply of PC available; a simple chemical reaction means that it is a very efficient pathway in terms of speed; however, it produces the least amount of ATP per reaction of all three energy systems.
Duration for which the system can operate	0–10 seconds	For the first five seconds of maximal activity, it is the dominant supplier of ATP, and it will be fully utilised after 10–12 seconds.
Cause of fatigue (what causes the system to either slow down or stop, and the effect this has on the athlete)	Depletion of PC stores	As the PC stores become depleted to the point of exhaustion, the body will be able to supply energy through the second pathway, which will have been activated by this point. The athlete will not recognise fatigue directly as a result of this, but from other sources such as local neuromuscular fatigue.
By-products of energy production (what else is produced as a result of this process)	Heat	The ATP-PC system is relatively circular. Therefore, the only by-product is a result of the chemical reactions – heat, which causes no adverse reaction to the athlete (heat is produced in all chemical reactions that involve the breakdown of a chemical bond).
Process and rate of recovery (how the system recovers for subsequent efforts and how long it takes)	PC resynthesis through rest 2–3 minutes	The resynthesis of PC occurs very quickly at rest, with close to half being restored within 30 seconds. This is why people should rest between sets of heavy resistance training or sprints, to ensure the body has enough energy for the next set, to enable work at maximal capacity.

Table 2.2 Characteristics of the ATP/PC system

Figure 2.11 Weightlifting training focuses on the development of the ATP-PC system

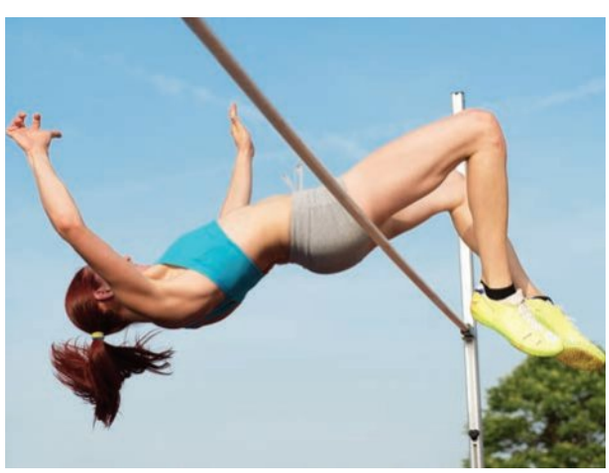

Figure 2.12 High jump involves short, maximal effort that relies on the ATP-PC system

Athletes in sports that involve a short and maximal effort focus their training on the development of the ATP-PC system. Examples include 100-metre sprints, weightlifting and high jump.

Lactic acid system

The second system used to resynthesise ATP is called anaerobic glycolysis. Another common name for this is the lactic acid system. However, most sources recognise this as a misnomer, as lactic acid is not actually found in the human body, and is often confused with lactate, which is found in the body.

The energy from this system comes from the breakdown of the simple sugar glucose, known as glycolysis. When this process occurs in the absence of oxygen, it is known as anaerobic glycolysis. The body is only able to store a small amount of glucose in the blood, and any excess is converted to its stored form of **glycogen**. As specific enzymes break down glucose, the energy released

glycogen the stored form of glucose, found in the muscles and the liver

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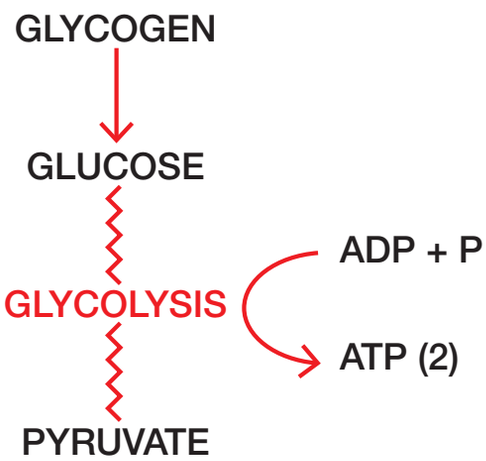

Figure 2.13 Anaerobic glycolysis – glycogen is converted to glucose, which is then broken down. This releases energy for the resynthesis of two ATP molecules and the by-product is pyruvate.

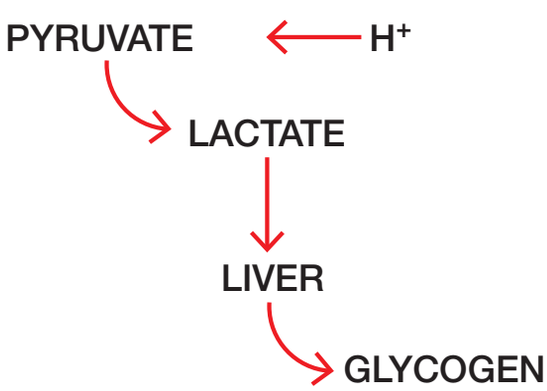

Figure 2.14 If insufficient oxygen is available to the working muscles, the pyruvate binds to pH-decreasing hydrogen atoms, forming lactate. This is transported to the liver to be metabolised, and converted back into glycogen.

pyruvate the substance resulting from glycolysis

is used to resynthesise ATP. The by-product of this reaction is called **pyruvate**.

Both ATP hydrolysis and glycolysis release hydrogen atoms. If insufficient oxygen is being supplied to the working muscle, the increasing accumulation of hydrogen atoms decreases the pH within the muscle, leading to slightly increased acidity (where people describe intense work as causing a 'burn'). This decrease in pH interferes with the muscle's ability to contract, leading to feelings of heaviness and fatigue, as well as reduced power output.

During this type of intense exercise, pyruvate plays an important role in helping buffer against the increasing muscle acidity by helping bind to

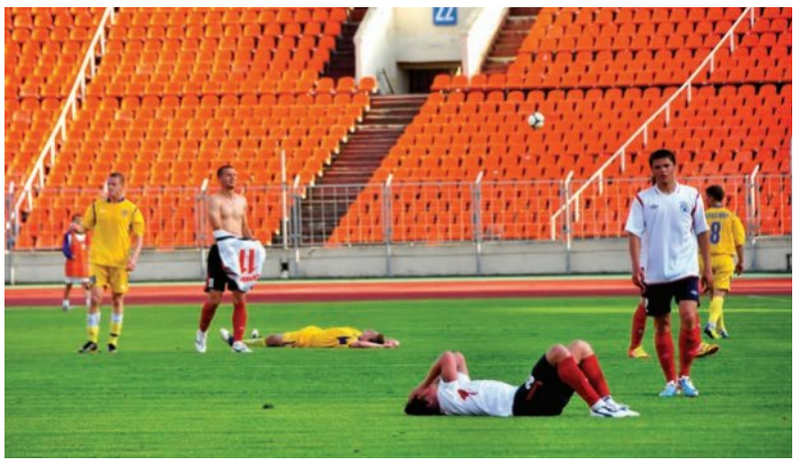

Figure 2.15 Soccer relies on anaerobic glycolysis because the players switch between intervals of very high intensity and intermittent rest

Figure 2.16 Sprinters focus their training on anaerobic glycolysis due to the intensity required over short time periods

Figure 2.17 Anaerobic glycolysis is utilised by rock climbers who employ short bursts of high intensity

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Syllabus point	Characteristic of energy system	Description
Source of fuel	Glucose (stored as glycogen)	Stored glycogen from liver and muscles is quickly converted into glucose to be used as fuel.
Efficiency of ATP production (speed of production and amount of ATP resynthesised)	Fast 2 ATP	While not as fast as ATP-PC (due to a more complex set of chemical reactions), the cells are able to break down glucose quickly, with more glucose being made available from the muscle and liver glycogen stores if necessary. Compared with the amount of glucose used, only a few ATP are resynthesised when working anaerobically.
Duration for which the system can operate	10–75 seconds	While this system begins to operate after five seconds, it reaches full capacity at 10 seconds, taking over from the ATP-PC system for maximal activity. This can be sustained for up to 75 seconds before muscular fatigue and a reduction in power cause the athlete to slow down. At sub-maximal efforts above 85 per cent, activity can last up to three minutes, with anaerobic glycolysis providing most of the energy.
Cause of fatigue (what causes the system to either slow down or stop, and what effect this has on the athlete)	Increasing muscle acidosis	If the pyruvate is unable to remove the hydrogen at the same rate of accumulation, the PH inside the muscle leads to acidosis. This causes feelings of fatigue, as well as impairing the ability of the muscles to effectively contract at full power.
By-products of energy production (what else is produced as a result of this process)	Lactate	As pyruvate joins with hydrogen to form lactate, the muscle is able to buffer against the increasing acidity and remove the hydrogen atoms that are responsible for this. The lactate is then removed away from the muscle to be metabolised in the liver.
Process and rate of recovery (how the system recovers for subsequent efforts and how long it takes)	Lactate removal Repeated effort: two to five minutes Complete lactate removal: 30 minutes to two hours	During team sports, an athlete is able to use anaerobic glycolysis after two to five minutes' rest following a long and intense effort (e.g. sprinting the length of the field). After intense exercise involving anaerobic glycolysis has stopped, the body must continue to transport the lactate to the liver to be converted back into glycogen and clear away all remaining hydrogen atoms. To support both of these situations, an active recovery will help maintain blood flow to flush the lactate out of the muscle as quickly as possible (e.g. keep jogging and have a gradual cool-down).

Table 2.3 Characteristics of lactic acid system

lactate a substance that is formed when pyruvate picks up hydrogen atoms, to help decrease muscle acidity; metabolised in the liver

the free hydrogen atoms, creating a new substance called **lactate**. During moderate- to high-intensity exercise, lactate is transported out of the muscle to the liver, where it is metabolised and turned back into glycogen, able to be used again as a fuel source.

However, if there is either insufficient or partially occluded (blocked) blood flow due to strong and very regular muscular contractions, then the rate at which lactate can be cleared out of the muscle decreases, leading to its accumulation. It is assumed that the increased lactate is the cause of increasing muscle acidity; however, this is merely evidence that the person is working anaerobically. The lactate is in fact helping to reduce the fatigue caused by vigorous physical activity.

Sports that rely heavily on anaerobic glycolysis are very intense. They may be a short sprint lasting 30 seconds to a minute (e.g. a 200-metre sprint or 100-metre swim). Sports where the athlete is working between intervals of very high intensity and intermittent rest – such as soccer, AFL, basketball and rock climbing – also utilise anaerobic glycolysis heavily.

Aerobic energy system

The third system used to resynthesise ATP is called the aerobic energy system. This energy system is by far the largest energy-producing pathway in the body, as it is used to fuel activity ranging from periods of sedentary activity right through to moderate intensity exercise. As the name suggests, this energy pathway is dependent on a constant and adequate supply of oxygen, so interplay with

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an efficient cardiovascular and respiratory system is needed. Of the three energy pathways, it is also the most complex, requiring a range of intricate chemical processes to produce energy.

A range of fuels can be used to produce energy from the aerobic energy system, with each being used at various levels of intensity and duration.

Carbohydrates

In the form of glucose and glycogen, carbohydrates are the most efficient fuel, known as aerobic glycolysis. This is generally the focus of athletes, as glucose is the dominant and preferred source of fuel while exercising at a sustained level.

Fats

Fats, which are stored as lipids, can also be used as fuel. The lipids are broken down into free fatty acids, which can be metabolised aerobically. This is known as aerobic lipolysis. Generally, while someone is resting and sedentary, they use fats as their primary fuel source. However, a gram of fat contains more than twice as much energy as a gram of carbohydrate, and yields 10 times as much ATP. Therefore, sedentary activity tends to burn very few grams of fat because it is such an energy-rich reserve. The logical assumption is that lipids must therefore be a better fuel source than glycogen. However, the oxygen demands required to burn fat as a fuel render it totally ineffective for aerobic exercise, as the demands on the cardiovascular system to supply the increased oxygen would lead to a dramatic reduction in power output. The

Figure 2.18 Tennis players must have a strong aerobic base in order to play matches over several hours

Figure 2.19 Sustained power output is required for a sport such as archery

Figure 2.20 Aerobic energy pathways are the predominant source of power for athletes participating in distance events like a marathon

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only time that fats are used during exercise is if the intensity is kept to a light to moderate level, or if the glycogen stores have been completely exhausted and exercise continues (generally after two hours of constant activity).

Protein

The last fuel the body can use is protein, in the form of amino acids. However, this would only occur in an extreme situation, where both the glycogen and lipid reserves had been exhausted (such as in a famine). This is a potentially dangerous situation, as the amino acids are sourced from the breakdown of muscle tissue, including muscle. The leads to extreme weight loss and can cause harm to the body as toxins are released.

There is a coordinated interplay between the use of carbohydrates and fats as a fuel for exercise, which is stimulated by the intensity of exercise. The body will use fats for as long as it is more efficient, with the aim of preserving glycogen stores for as long as possible until they are needed. Elite endurance athletes aim to perform using fats for as long as possible in a race, to ensure they have sufficient glycogen stores as the intensity increases.

Sports that typically rely on the aerobic energy system either require very low physical exertion – such as archery – or a sustained and moderate level of power output. Typically, most team sports require a strong aerobic base to provide foundation to their anaerobic fitness. This is particularly true for sports such as tennis, soccer and AFL, where players are active for one to three hours, and can cover over 10 kilometres in a game. Of course, longer-distance events such as a marathon or ultra-ironman triathlons are powered predominantly by aerobic energy pathways.

The three components of the aerobic energy system

There are three significant components of the aerobic energy system:

- aerobic glycolysis
- Krebs cycle
- electron transport chain.

While using glucose, the aerobic energy system can resynthesise 38 ATP for each completed chemical pathway. If the athlete is using lipids because they have either run out of glycogen (commonly known as a 'bonk') or are at closer to resting levels, they can produce up to 460 ATP.

The body's use of each energy system represents a complex interplay of fuel supply, as each energy system seamlessly draws energy from all three systems to varying degrees. At certain intensities and times of events, the body

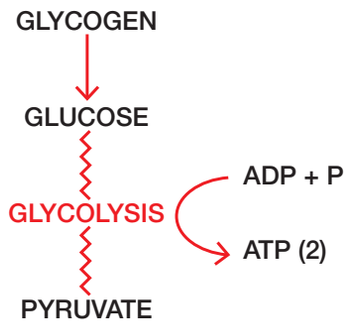

Figure 2.21 Aerobic glycolysis operates in the same manner as anaerobic glycolysis. A glucose molecule is broken down, providing enough energy for the resynthesis of two ATP. However, because there is sufficient oxygen available, the pyruvate does not need to attach to pH-decreasing hydrogen atoms, and instead is used in the second component of the aerobic energy system.

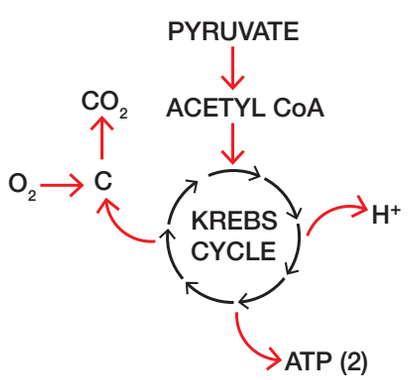

Figure 2.22 In the Krebs cycle, the pyruvate is converted into an enzyme called acetyl coenzyme A (acetyl CoA), which enters a complex set of reactions known as the Krebs cycle. The Krebs cycle itself resynthesises a further two molecules of ATP, and the resulting hydrogen electrons are then transported to the third component. In addition to this, carbon is another by-product of the Krebs cycle; it joins with oxygen to form carbon dioxide, which enters the bloodstream to eventually be breathed out.

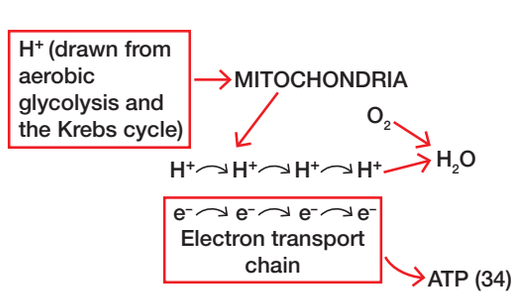

Figure 2.23 Diagram displaying the relevant contribution of the three energy systems in providing the fuel for ATP resynthesis during exercise: the hydrogen electrons from the Krebs cycle enter the electron transport chain, sometimes described as oxidative phosphorylation. These electrons undergo a series of reactions and are eventually reduced to water, which is removed as a waste product. The result of these reactions is a large amount of energy that is used to resynthesise 34 ATP molecules.

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Syllabus point	Characteristic of energy system	Description
Source of fuel	Carbohydrates (moderate intensity) and fat (rest to low intensity)	Carbohydrates, in the form of glucose, are used primarily for aerobic exercise, when the intensity increases towards and above 70 per cent of maximal heart rate (220 – age) At lower intensities, fat is the preferred fuel, as it is dense in energy. However, fat as a fuel does require more oxygen.
Efficiency of ATP production (speed of production and amount of ATP resynthesised)	Slow 38 ATP	The time taken for energy to be produced aerobically is slow when compared with the other pathways. However, once functioning, the yield of ATP is far greater. This is even more so when fat is the fuel source, with over 400 ATP being produced. However, the excessive oxygen required means this is best used at rest.
Duration for which the system can operate	60 seconds +	It takes at least 60 seconds for aerobic glycolysis to start providing energy, as the increased oxygen demand has to be delivered via the cardiovascular system. However, once these pathways are established, the aerobic energy system can continue working for hours as long as fuel sources are consistently replenished (such as a 24-hour mountain bike race).
Cause of fatigue (what causes the system to either slow down or stop, and the effect this has on the athlete)	Depleted fuel sources	A consistent level of moderate intensity can be sustained for up to two hours if glycogen stores are full. If these are not replenished regularly, then the athlete will switch to using fats, causing the athlete to quickly fatigue and have to slow down due to the increased oxygen demand. Other causes of fatigue are general neuromuscular and mental fatigue, as a result of the sustained activity.
By-products of energy production (what else is produced as a result of this process)	Carbon dioxide Water Heat	These by-products do not have a negative effect upon performance, and are simply removed as waste products of the body. The heat produced will stimulate other changes in the body, such as vasodilation and sweating, to ensure body temperature is maintained at 37°C.
Process and rate of recovery (how the system recovers for subsequent efforts and how long it takes)	Replenish fuel stores 24 hours	Following a bout of sustained and intense exercise, athletes must ensure they eat adequate amounts of food to replenish depleted fuel stores. This primarily involves eating 50 to 100 grams of carbohydrates within 30 minutes of exercise. The process of restoring liver and muscle glycogen can take up to a full day.

Table 2.4 Characteristics of the aerobic system

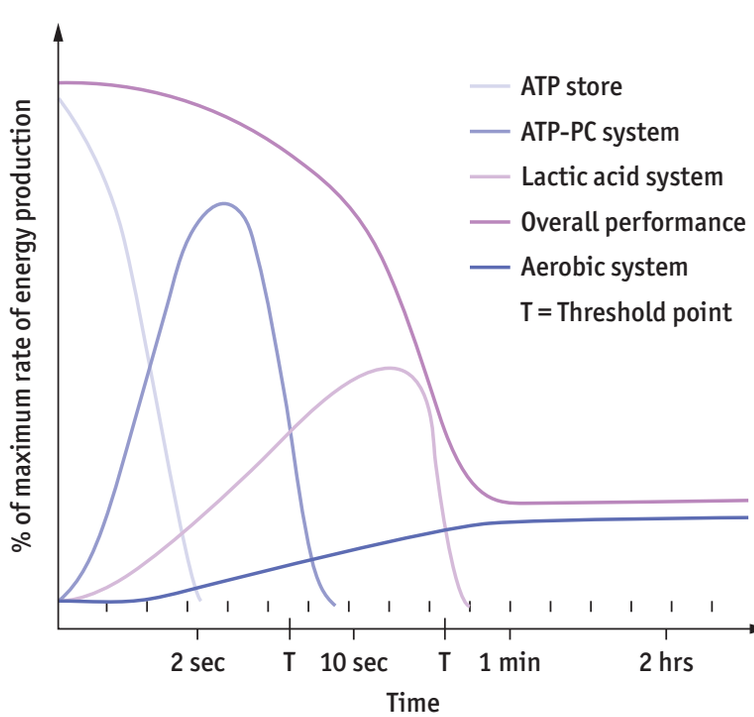

Figure 2.24 Graph displaying the relevant contribution of the three energy systems in providing the fuel for ATP resynthesis during exercise

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Going further 2.3

Inquire

1 For a selected sport, research the role of the energy systems in fuelling activity for that sport.
2 Research training activities that relate to this energy system.

relies more heavily on one energy system over the others; however, the other energy systems can be used almost instantly if required.

For example, if an athlete at rest instantly completes five tuck jumps, the ATP CP system will be dominant. A 30-second all-out effort will rely on mostly anaerobic glycolysis following the use of CP reserves. Steady state training at a moderate intensity of 60 per cent MHR will predominantly use the aerobic energy system to fuel the activity.

Checklist 2.4

Complete a summary table similar to the one below that covers all syllabus points for each energy system.

Types of training and training methods

In order to effectively design training programs for athletes, a clear understanding of the contributions made by the physiological demands, movement

	ATP-PC	Lactic acid system	Aerobic system
Intensity of effort			
Total duration			
Duration as dominant energy source			
Source of fuel			
Efficiency of ATP production (how many ATP and how quickly they are produced)			
By-products of energy production			
Process and rate of recovery			
Limitations/cause of fatigue			
Sporting example			

Table 2.5 Summary table

Sport	ATP-PC/LA	LA/Aerobic	Aerobic
Basketball	60	20	20
Fencing	90	10	
Field events	90	10	
Golf swing	95	5	
Gymnastics	80	15	5
Hockey	50	20	10
Distance running	10	20	70
Rowing	20	30	50
Skiing	33	33	33
Soccer	50	20	30
Sprints	90	10	
Swimming 1500 metres	10	20	70
Tennis	70	20	10
Volleyball	80	5	15

Table 2.6 Energy system contribution of a variety of sports
Source: ASC (see www.cambridge.edu.au/hscpdhpe1weblinks).

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patterns and energy system of the game or sport is necessary.

The types of training movements utilised and the specific movement patterns adopted should mimic the demands of the sport. As an example, an explosive sprint athlete will prepare very differently from a marathon runner. Similarly, a Rugby League player's training program will vary from that of a golfer. Examples of the energy system contribution of a variety of sports are provided in Table 2.6.

This demonstrates that while very few sports rely upon the contribution of one energy system to fuel the exercise, there are variations relating to the contribution of the energy systems to the sporting performance. The field events discus and hammer throw are fuelled almost entirely by the ATP-PC system. In contrast, distance running events are fuelled almost entirely by the aerobic energy system. Team sports like soccer are intermittent high-intensity sports that change constantly in speed and direction, so the energy system's contribution varies, depending on the position. Due to the variations in many sports in relation to the energy system contributions required, differences also exist in the types of physical qualities that are required to meet the physical demands of the event. These physical qualities include:

- strength
- speed
- endurance
- flexibility.

The relationship between the physical qualities of strength, speed and endurance

Only a limited number of sports rely on the development of just one physical attribute, so the athletes' physical preparation will vary significantly:

- Olympic power lifting relies on strength and speed.
- Team sports like soccer rely on speed, endurance, flexibility and some strength.
- Impact sports like Rugby League rely on all three physical qualities as well as flexibility.

Figure 2.25 Distance running events are fuelled almost entirely by the aerobic energy system

There are many reasons why people choose to exercise, including to:

- improve health and well-being
- improve physical condition
- lose weight
- cope with daily **stress**
- feel better
- become an elite athlete
- overcome an injury.

Regardless of the reason people choose to exercise, there are basic training principles that must be understood and adhered to if the goals of the program are going to be met.

stress a psychological and physiological reaction to a perceived threat

Aerobic training

Utilising the aerobic energy system, an athlete's aerobic endurance levels are commonly developed using four traditional methods of training:

- **continuous training**
- **fartlek** intermittent training
- interval training
- circuit training.

continuous training an extended, predominately steady-state training session that lasts no less than 15 to 20 minutes

fartlek training involving varying the pace or speed of your run, alternating between fast segments and slow jogs

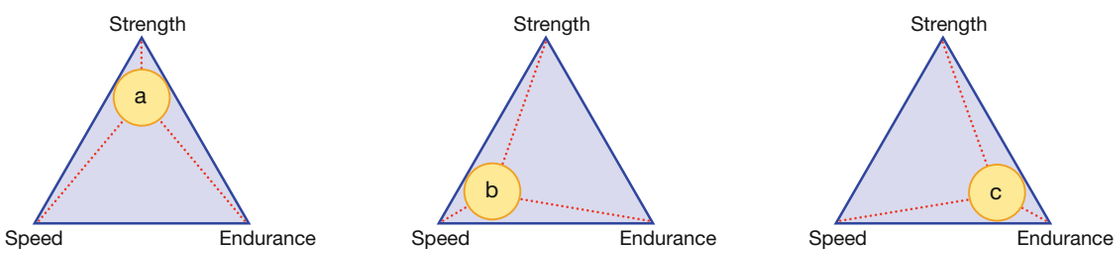

Figure 2.26 When the relationship between the physical qualities is shown as a triangle, strength is at the top of the triangle, speed is at the left corner and endurance is at the right corner

Source: Level 1 ASCA course notes, Module 2 – Training Theory, Planning Training and Periodisation Basics.

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Figure 2.27 Hurdling relies on speed, endurance and strength

Continuous training

Continuous training is an extended, predominately steady-state training session that lasts no less than 15 to 20 minutes. Continuous training is the most commonly considered training method for aerobic development, and embodies what most people think of as training for the aerobic energy system. This form of training is most effective for lower level athletes and racing endurance sports like rowing, cycling, distance running and swimming, but it is much less common in sprints, power games, field events and court sports.

Continuous training guidelines

- **Duration:** Can be as short as 20 minutes, but will depend on the duration of the event for which the athlete is training. Endurance sports athletes will often need to do continuous training sessions much longer than an hour in length.
- **Mode:** Usually specific to the demands/nature of the sport (runners run, cyclists ride and swimmers swim); however, it can vary from the nature of the sport (cross-training effects).
- **Frequency:** Two to three times per week.
- **Type:** Continuous – 'steady-state' or 'mixed intensity' continuous.
- **Duration:** Generally >15–20 minutes in duration.
- **Volume:** Depends on mode, type, duration, intensity, age and experience of the athlete.
- **Intensity:** Generally sub-maximal (70–85 per cent of heart rate maximum) but mixed intensity continuous is effective.

Fartlek

Fartlek means 'speed play', and was made popular by Emil Zatopek. It is an extended continuous training session with intermittent bursts of speed throughout the session. Due to the intermittent bursts of high-intensity effort during the session, both the aerobic and anaerobic energy systems can be targeted. Fartlek training sessions therefore resemble a combination of both continuous and interval training. Middle-distance track athletes often adopt 'speed play' sessions as part of their training programs.

Going further 2.5

Inquire

Provide an example of a sport that would benefit from continuous training. Assuming the athlete is relatively young, provide examples of the mode, frequency, type and duration of the training session that would be appropriate for this sport.

Example of fartlek training

- Warm-up:
  - 10-minute walk
  - dynamic mobility exercises
- fartlek session (30 minutes approximately):
  - two-lap (800 metres) jog at 70 per cent
  - 100-metre stride-through at 85 per cent
  - two-lap jog (800 metres) at 70 per cent
  - 200-metre intense run at sprint at 90 per cent
- repeat six times.

Fartlek training guidelines

- **Mode:** Usually specific to the demands/nature of the sport. The sport will also determine the length of the speed bursts.
- **Frequency:** Generally two to three sessions per week.
- **Intensity:** Generally sub-maximal (75–80 per cent) interspersed with much higher (maximal intensity) bursts of varying durations during the course of the exercise.
- **Duration:** Can be as short as 15 minutes, but generally 20–30 minutes with bursts of intensity ranging from 10 seconds to several minutes. The duration will be dictated by the duration of the event for which the athlete is training.

Going further 2.6

Create

Design a fartlek training session for a particular sporting event. When designing the training session, consider the mode, intensity and duration of the session.

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VO_2 max the maximum amount of oxygen a person's body can absorb during exercise, measured in millilitres of oxygen per kilogram per minute absorbed into the muscles

Interval training

Interval training involves intermittent training at higher training intensities with defined work and rest periods to develop the aerobic energy system. Interval training is a common method of developing sport-specific endurance. High-level, experienced athletes are more likely to benefit from interval training methods than they are from continuous and fartlek training methods. There is no limit to the number of possible interval training methods.

Type	Duration	Intensity
Short intervals	Less than 30 seconds	Greater than 100 per cent VO_2 max
Medium intervals	Thirty seconds to one minute	Near 100 per cent
Long intervals	One minute or more	85–100 per cent

Table 2.7 Classifying interval training methods

Source: Level 2 ASCA course notes, Module 6 – Energy System Conditioning.

Interval training guidelines

- **Intensity:** Varied, can be sub-maximal, maximal or supra-maximal intensities with sub-maximal recovery periods.
- **Duration:** Short, medium and long intervals. The duration will be dictated by the duration of the event for which the athlete is training. To remain aerobic, recovery is generally 1:1 work to rest ratio or less.
- **Frequency:** Minimum one session per week if other training activities are taking place. Generally two to three sessions per week.
- **Mode:** Dictated by the sport. The sport will also determine the ideal length of speed bursts within the session.

Circuit training

Circuit training is an effective method of conditioning that develops strength and endurance (both aerobic and anaerobic), flexibility, coordination and game-specific skills within one exercise session. The main benefit of circuit training is that it effectively develops both strength and cardiovascular fitness in the same exercise session.

Circuit training describes how the workout is structured, not necessarily the type of exercises being performed. Typically, circuit training comprises a variety of exercises or stations that are completed within a given timeframe or for a prescribed number of repetitions with minimal rest in between.

Figure 2.28 Netball players would benefit from continuous training due to its positive impact on aerobic development

While circuit training and interval training are somewhat similar in nature, there are some major differences. Interval training generally focuses on one type of exercise – such as running, cycling or swimming – during the session, and this may vary in intensity during the session. Circuit training consists of a large variety of exercises of shorter duration in one training session, and allows for an endless variety of training routines.

A well-designed circuit provides a balanced workout that targets all the muscle groups and builds cardiovascular endurance. Circuit training can also be used to correct the muscle imbalance that often occurs in athletes. In addition, it is used to provide a quick, time-efficient, high-intensity metabolic body fat-burning session for overweight athletes. Circuits also provide a high-intensity skills training session for athletes.

The large variety of training sessions that can be utilised in circuit training means that it is useful for both beginner and advanced athletes.

Example of a circuit training session for a soccer player

Nine stations, working in pairs, 30 seconds on, 30 seconds off for three minutes:

- sit-up header
- 10 line jumps then control pass
- 10-metre sideways movement then chest volley
- shuttle out and back with header
- length of field dribble (30-second run, 30-second juggle)
- loose ball chase, dribble back to start

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- back down, jump up header
- figure eight agility, one with ball, one without
- forward 10 metres, volley, backward 10-metre header.

Example of a bodyweight circuit for a youth athlete

Ten stations, 30-second work period, 30-second rest period, two laps:

- wall squats
- push ups
- prone hold (hovers)
- side lunges
- Swiss ball crunches
- hands elevated push-ups
- bench step-ups
- side hold (side hover)
- reverse lunges
- bench dips.

As the athlete's fitness improves, the difficulty of the exercise may be increased by increasing the exercise time, increasing the weights or resistance used, adding more difficult exercises or decreasing the amount of time spent resting between stations.

Going further 2.7

Create

Design a circuit training session for an athlete of your choice. Discuss the exercise selection, the number of stations, repetitions and rest periods.

Figure 2.29 Lifting weights can constitute part of a circuit training session

Circuit training guidelines

- **Mode:** Usually specific to the demands/nature of the sport. The sport will also determine the types of drills performed in the circuit.
- **Frequency:** Generally two to four sessions per week, depending on other components of training being performed. Allow 48 hours of rest for all muscle groups between sessions.
- **Type:** An endless variety of circuit options are available. Circuits typically consist of eight to 12 exercises or stations that target the entire body.
- **Intensity:** The resistance selected while challenging should allow the athlete to perform the exercise for the duration of the effort. For aerobic endurance, decrease the intensity of the exercise at each station, increase the length of time spent at each station and shorten the rest between stations to keep the heart rate continuously elevated. For a muscular strength focus, increase the intensity (resistance) of the exercise at each station and the rest time between stations to allow full muscular recovery between exercises.
- **Duration:** Generally, the activity at each station is performed for 30–90 seconds with 15 to 30 seconds of recovery between each station. Three to four sessions at least 20 minutes in duration may be performed per week.

Anaerobic training

Anaerobic training is used by athletes in non-endurance sports, and is effective in developing strength, speed and power. It is also used by body builders to build muscle mass. Anaerobic training leads to greater performance in short-duration, high-intensity activities, which last from mere seconds up to about two minutes. Activities lasting longer than two minutes are predominantly aerobic in nature.

Anaerobic energy system training comprises both:

- the alactic system – the predominant energy contribution for intense efforts up to 8–15 seconds, and
- the lactic system – the predominant energy contribution for intense efforts up to 40–60 seconds.

Examples of anaerobic alactic sports include 100-metre sprinting, Olympic lifting and the vault in gymnastics, while 100-metre and 200-metre swimming, 400-metre hurdling and sprint cycling are examples of anaerobic lactic sports.

The high-intensity nature of both anaerobic alactic and lactic sports means athletes

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	Intensity (%)	Duration of repetitions	Work	Rest
Alactic power	95–100	5 seconds	4–8 repetitions	1>10
Alactic endurance	90–95	10 seconds	3–5 repetitions	1:08
Lactic power	95–100	10–15 seconds	3–5 repetitions	1:06
Lactic endurance	90–95	30–60 seconds	3–5 repetitions	1:03

Table 2.8 Anaerobic training guidelines

Source: Level 1 ASCA course notes, Module 7 – Energy System and Endurance Conditioning.

participating in these sports have a limited supply of energy, so they fatigue quickly and require extended recovery periods to allow the replenishment of the anaerobic energy supply.

Both the anaerobic alactic and lactic energy systems have two components:

- anaerobic power – the capacity to do the most work in the anaerobic energy system
- anaerobic endurance – the capacity to maintain work in the anaerobic energy system

All anaerobic training is performed using the interval method.

Flexibility training

Flexibility can be defined as the range of movement around a joint. The benefits of flexibility training for athletes include:

- enhanced movement performance
- reduced muscle soreness and tension
- reduced injury risk – both in the short and long term
- improved muscular coordination
- enhanced physical and mental **relaxation**.

relaxation the use of specific techniques to help calm an over-emotive athlete, suffering from high levels of stress, anxiety or arousal

Note: In physical preparation for professional team sports, there has been a significant shift away from prolonged static stretching prior to training sessions and games. Evidence suggests that prolonged static stretching prior to explosive intermittent team sports may suppress the firing rate of the muscles. Instead, warm-ups comprise dynamic mobility and skill drills that progressively increase in speed and intensity, and warm the athlete up dynamically. Static stretching is, however, an important component of recovery and the cool-down.

The four most commonly used methods of developing joint flexibility include:

- static stretching
- ballistic stretching
- proprioceptive neuromuscular facilitation (PNF)
- dynamic stretching.

Static stretching

Static stretching is a method used to gradually lengthen the muscle while the body is at rest. The stretch position is held for a minimum of 30 seconds to two minutes in order to achieve the muscle-lengthening benefits of the stretch. Athletes often experience a warm sensation or some mild discomfort, either during or directly after the stretch. Correct methods of static stretching lessen the sensitivity of tension receptors within the muscle, relaxing the muscle and resulting in increased muscle length.

Ballistic stretching

Ballistic stretching is a form of dynamic stretching that consists of repeated movements that bounce, jerk or swing through the end-range of motion. Ballistic stretching uses the momentum of a moving body or a limb in an attempt to repeatedly force it beyond its normal range of motion – for example, bouncing down repeatedly to touch your toes. This

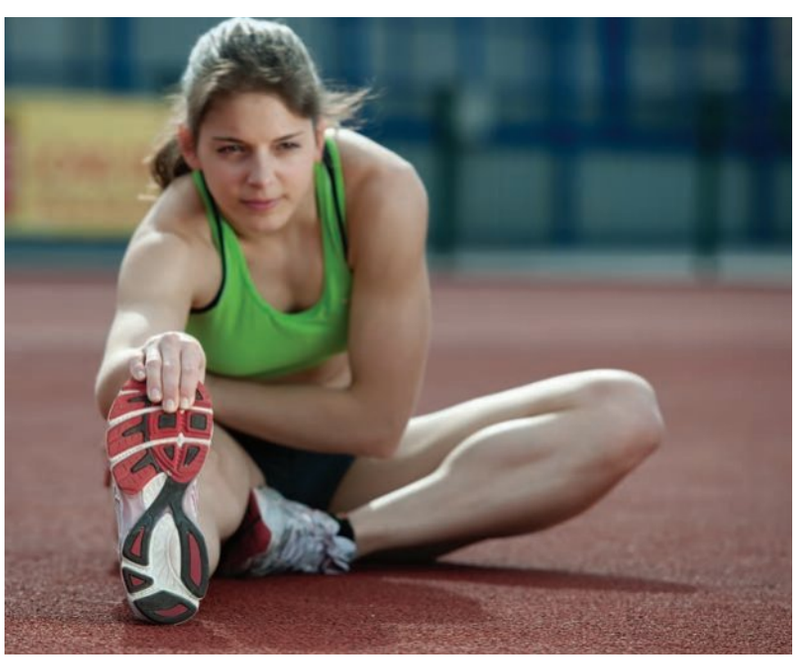

Figure 2.30 Stretching to promote flexibility can offer many benefits for athletes

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Figure 2.31 An example of PNF stretching

type of stretching is not considered useful, and can lead to injury. It does not allow your muscles to adjust to, and relax in, the stretched position. It may instead cause them to tighten up by repeatedly activating the stretch reflex.

It is extremely important to be careful when incorporating ballistic methods into a warm-up routine. Some speed, power and gymnastics athletes do incorporate ballistic movements after a controlled dynamic warm-up.

PNF stretching

Proprioceptive neuromuscular facilitation (PNF) is usually a partnered form of stretching that involves lengthening the muscle against resistance; it is often referred to as the 'contract', 'hold' and 'relax' method of PNF stretching.

While there are a variety of forms of PNF stretching, it is one of the most effective methods of increasing the range of motion of a muscle, and is best employed following training sessions or games. Using the lying hamstring stretch as an example, the common variations in PNF stretch methods are provided below.

Hold–relax PNF stretching

- **Step 1:** This is a partnered method of PNF hamstring stretch where a partner moves the athlete's extended leg to a point of mild discomfort (see Figure 2.31). The athlete relaxes and holds the stretch for a period of 10 seconds.
- **Step 2:** The partner instructs the athlete to gently contract the hamstring isometrically by pushing the extended leg against the partner for a period of six seconds.
- **Step 3:** The athlete is then instructed to 'relax' while the partner gently takes the extended leg through a slightly greater range of motion.
- **Step 4:** A second passive stretch is held for 30 seconds.

Contract–relax PNF stretching

- **Step 1:** The same as the hold–relax PNF stretch.
- **Step 2:** The partner instructs the athlete to contract the hamstring concentrically by pushing their extended leg against the partner's hand. Enough force and resistance is applied by the partner to the athlete's leg to allow the athlete to push the extended leg through the full range of motion. This is referred to the 'contract' phase.
- **Step 3:** The same as the hold–relax PNF method.
- **Step 4:** The same as the hold–relax PNF method.

Hold–relax with opposing muscle contraction

- **Step 1:** The same as the hold–relax and contract–relax PNF stretch.
- **Step 2:** The partner instructs the athlete to gently contract the hamstring isometrically by pushing the extended leg against the partner for a period of six seconds (same as the hold–relax method).
- **Step 3:** The partner completes a second passive stretch by taking the extended leg through a greater range of motion. Unlike the hold–relax and contract–relax methods, the athlete is instructed to pull the extended leg in the same direction in which the partner is pushing the leg.
- **Step 4:** Same as the hold–relax and contract–relax methods.

PNF stretching guidelines

- PNF stretching is a strenuous form of stretching, so 48 hours of rest should be allowed between PNF stretching routines.
- Only one exercise is necessary per muscle group.
- Two to five sets of a particular exercise should be chosen for each muscle group.
- Following the isometric or concentric contraction phase, ensure that the passive stretch is held for 30 seconds.
- PNF stretching methods should not be employed for children.
- If the PNF session is performed cold, allow for a five- to 10-minute light aerobic warm-up incorporating light dynamic movements prior to the PNF session.
- *Do not* PNF stretch prior to competition or training sessions.

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Dynamic stretching

Dynamic stretching has become the most popular and widely used method of actively stretching muscles among many professional soccer, Rugby League, AFL and Rugby Union athletes. Dynamic stretching involves moving parts of the body in a controlled manner, with movements gradually progressing in speed and range of motion. It a should be the dominant form of stretching in a warm-up. Examples of dynamic stretching include walking lunges that gradually take longer and longer strides with each rep, or shoulder circles with larger diameters of movements each rep.

Figure 2.32 Walking or dynamic lunges are a form of dynamic stretching

Strength training

Strength training consists of a variety of resistance exercises and methods that promote muscular contractions, which build muscular size, strength and power. For this reason, strength training has become extremely popular with many team and individual sport athletes.

Strength training is the primary focus of training among explosive strength, power and muscular size athletes, like those involved in power lifting, Olympic lifting, strongman, bodybuilding and the throwing events shot put, discus and javelin.

Speed-, power- and agility-based sports like sprinting, hurdling, long jump, high jump, wrestling, tennis and the team sports soccer, AFL, Rugby League and Rugby Union employ strength training as part of their training programs.

Strength training can also increase muscular endurance and aerobic capacity (circuit training). For this reason, strength training is also utilised by endurance sports like rowing, cycling and middle- and long-distance running and swimming.

Besides the obvious benefits of strength training for athletes, appropriately designed strength

Figure 2.33 Athletes of many varied sports incorporate strength training into their training programs

training methods also promote a variety of health-related benefits that include:

- general health and well-being
- muscle, tendon and ligament strength
- bone density and strength among the elderly
- improved joint function and stability
- reduced injury risk
- increased metabolism
- body fat loss
- improved cardiovascular fitness
- rehabilitation from injury.

Types of muscle contraction

Muscle contractions can be divided into:

- isotonic
- isometric
- isokinetic.

Figure 2.34 Strength training promotes a wide range of benefits including improved joint function and stability

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Figure 2.35 Isokinetic sports equipment

Figure 2.37 The eccentric muscular contraction occurs as the muscle lengthens

Isotonic contractions

Isotonic contractions involve muscular movement, and comprise two important muscular contractions. The concentric phase occurs when the muscle shortens in length (see Figure 2.36). The eccentric muscular contraction occurs as the muscle lengthens (see Figure 2.37).

Concentric muscular contractions are not only common to many sporting activities, but occur in everyday life.

While eccentric movements are not as common as concentric movements, eccentric muscular strength contractions play an important role in controlling the deceleration of movements.

As the soccer player kicks the football, the quadriceps muscle contracts concentrically as the leg straightens. At the same time, the hamstring muscle contracts eccentrically to control the deceleration of the leg.

Isometric contractions

The working muscle does not change in length during isometric contractions – for example, pushing both hands against the sides of an immovable object like a doorway. While the muscles of the arms are contracting forcefully, there is no movement.

Isokinetic contractions

Isokinetic muscular contractions are similar to isotonic muscular contractions in that both promote a change in muscular length during the contraction. Unlike isotonic movements, isokinetic muscular contractions occur at a constant speed, making them less relevant to many sporting

Figure 2.36 The concentric phase occurs when the muscle shortens in length

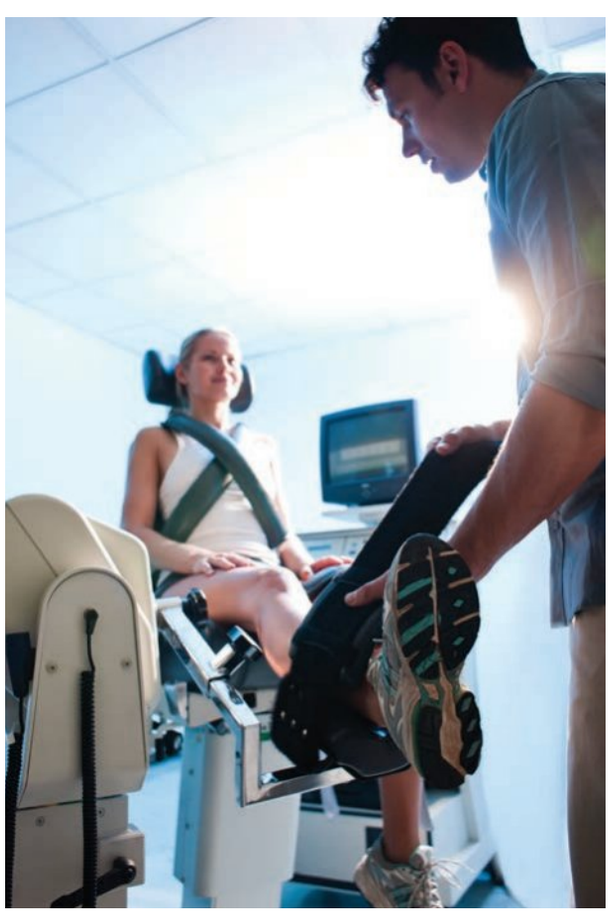

Figure 2.38 Isokinetic sports equipment

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Figure 2.39 The barbell squat

activities. Isokinetic equipment is also extremely expensive.

Strength training methods

A variety of strength training methods are commonly employed by both professional athletes, and there is debate around which method is best for strength development. Generally speaking, the answer depends on many factors, such as the age, experience and specific goals of the program.

Strength training methods include:

Free weights

Free-weight equipment includes barbells, dumbbells, kettle bells, medicine balls and sandbags. It is the most commonly utilised equipment in the strength training of many professional team and individual sport athletes, as it is versatile and inexpensive. Free weights are generally preferred over weight machines for strength and conditioning in the development of sport-specific strength training programs, as free weights better simulate sport-specific lifting situations and promote whole-body stabilisation as athletes are required to recruit many stabilising muscles in order to control the weight by maintaining correct postural form and lifting techniques. Weight machines, on the other hand, limit the athlete to specific movements that are fixed in direction.

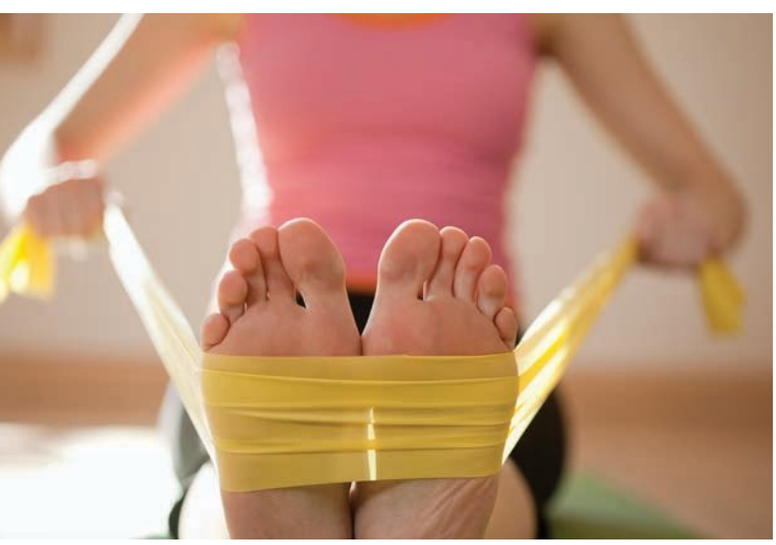

Figure 2.40 Resistance bands have a variety of uses and benefits in the application of strength training

Figure 2.41 The dumbbell forward lunge

Weight machines

Weight machines offer a large variety of exercises that guide the client through the movement in a controlled, supported fashion, so less attention needs to be paid to technique, form, balance, coordination and muscle stabilisation. Machine weights are more commonly used for inexperienced strength trainers, the elderly and those recovering from injury. Machines are also useful if circuit training is performed. Circuit training involves going from one machine to the next with little rest in between. Machines allow quick movement from one exercise to the next without having to change dumbbells or add weight to the bar.

Resistance bands

Resistance bands have a variety of uses and benefits in the application of strength training among both professional athletes and general clients. Bands are portable, light and inexpensive compared with free weights and weight machines. Band work also provides a constant tension on the muscle through a movement similar to that

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Figure 2.42 A pin-loaded inclined chest press is a common example of a weight machine

provided by cable machines. Like free weights, bands require the recruitment of more stabiliser muscle in order to control the movement and offer a large variety of movements in many directions. The downside to band training is that they are not as demanding as free or machine weights. It is also impossible to determine the weight being lifted on the bands.

Strength and conditioning trainers often use light resistance bands as part of rehab training

Figure 2.43 By adding chains to the barbell squat, the exercise becomes an accommodated resistance exercise. The movement becomes heavier as the athlete stands.

Figure 2.44 The hydraulic seated chest press

where light band work is used to strengthen the rotator cuffs, knees, glutes and groin muscles prior to training.

Heavy resistance bands are also used during maximal strength and explosive strength training movements in the gym. By applying bands to the bar during the bench press (see picture below), there is an increase in resistance through the range of motion – this is called accommodating resistance. Heavy chains are also often used to provide accommodated resistance among experienced strength athletes.

Hydraulic machines

Unlike weight machines, hydraulic machines do not require any selection of weight or resistance. By simply pushing or pulling against the lever using your arms or legs, the hydraulic cylinders provide counter-resistance to the movement. The harder

Figure 2.45 The band is attached to the bar during the bench press to provide accommodated resistance. The weight gets heavier as the bar reaches the top of the movement.

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Summary 2.8

1 What methods of training are there for aerobic-based training? What benefits would result?
2 What methods of training are there for anaerobic-based training? What benefits would result?
3 What methods of training are there for flexibility-based training? What benefits would result?
4 What methods of training are there for strength-based training? What benefits would result?

Checklist 2.9

1 Which types of training are best suited to a range of sports?
2 Which training methods would be most appropriate?
3 How would this type of training affect performance?

and faster you push or pull, the more resistance you create within the machine. One of the main benefits of hydraulic machines is that they offer the ability to do two movements at the same time. For example, during the hydraulic seated chest press (see Figure 2.44), the client works the pec muscles as the levers are pushed out, while the back muscles (lats) are worked as the levers are pulled back towards the chest. The downside is that hydraulic machines do not provide an eccentric contraction, which is the lowering phase of an exercise.

Figure 2.46 Progressive overload refers to training becoming gradually harder the fitter or stronger you become

Principles of training

Progressive overload

Progressive overload is one of the most commonly used training techniques, and is recognised across the fitness industry as critical to the success of fitness programs. Progressive overload refers to training becoming gradually harder the fitter or stronger you become. Progressive overload is most commonly used in strength-based programs; however, the principle can be applied to cardio programs as well. For example, in a gym program, a participant may bench press 40 kilograms in Week 1, 42.5 kilograms in Week 2, 45 kilograms in Week 3 and so on. As the body adapts, the training becomes harder and this increases the capacity of the body to perform.

This technique encourages constant improvement, and is great for those in the early stages of a training program. The principle is also an effective way for individuals with very little base fitness. Over time, however, the improvement and the ability to continuously overload the body will begin to plateau. At this stage, the participant and their coach and/or trainer will need to reassess their training goals and consider a program that focuses on maintenance and/or including some variety.

Specificity

The principle of specificity refers to the training being targeted towards the goals and objectives of the athlete and/or the demands of the chosen sport. When designing a program that incorporates specificity, the athlete and coach should consider the following questions:

- Which energy system is to be targeted?
- Which muscle groups will be targeted?
- Which components of fitness will be targeted?

If these questions were applied to the training program of a 100-metre sprint athlete, the training should be targeted at enhancing the ATP-PC energy system. Strength training would target the large upper leg, lower back and core muscles, while components of fitness critical to a training program that upholds the integrity of specificity would

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include strength, power and reaction time. It would be counter-productive for this athlete to participate in long-distance road runs, as this style of training would do little to enhance the energy system required or fitness components involved.

Specificity in training programs is now present in team sports, depending on the position of play for each athlete. A close analysis of Rugby League and a comparison between the positions of prop and halfback is a good example. Visually, these two athletes will typically have a very different body composition. The positional requirements and responsibilities are also quite different, which means the components of fitness these positions utilise will not be the same. A front rower must be strong and powerful, while the halfback will require greater speed, agility and cardiovascular fitness. Hence their respective training programs should be specific to those demands.

Reversibility

Reversibility can colloquially be explained as 'use it or lose it'. The effects of training will begin to diminish if training stops. Within two weeks of ceasing to train, muscle density will decrease and the positive effects of cardio training will begin to diminish. While an athlete does not need to continuously improve throughout their training schedule, it is important to have a maintenance program in place to ensure that the improvements gained are not subsequently lost because training stops or slows.

Variety

Premierships, gold medals, green jackets and yellow jerseys take many years of hard, strenuous and often repetitive training to achieve. This is where the principle of variety is important. A coach who can provide their athlete with variety in their training will be able to maintain the **concentration** and motivation of their athlete longer. The principle of variety simply affords the athlete with an opportunity to continue training without necessarily doing something that is specific to their regular sport. A good time to include some variety in an athlete's training could be during the off-season and/or when the athlete is recovering from injury. It might be as simple as including some boxing as part of a cardio routine for a netball squad or encouraging a surfer to do yoga.

concentration focusing one's mental attention on a particular thought process, while ignoring other irrelevant thoughts or events being perceived

Yoga is a popular form of cross-training for athletes. While it provides variety in a training program, it also has proven benefits for breathing, flexibility, core strength and relaxation.

Figure 2.47 Yoga is a popular form of cross-training for athletes that can add variety to a training program

Training thresholds

Thresholds refer to specific points of measurement that, when passed, take someone or something to another level. When it comes to training thresholds, there are two specific points of measurement that are very important: the aerobic threshold and the anaerobic threshold. For an athlete to be able to use these thresholds successfully within training, they must be able to measure when their body reaches the thresholds. Athletes and coaches now use more tools and resources to measure performance during training and competition than ever before. Heart rate, however, remains one of the most accurate indicators of intensity, and it is intensity that determines the threshold at which someone is training.

Heart rate can be measured both quickly and accurately with basic equipment. To understand heart rate, it is first necessary to calculate a person's maximal heart rate. This is calculated by subtracting their age from 220. This would mean somebody who is 20 years of age would have a maximal heart rate of 200 beats per minute – that is, 220 – 20 = 200. The intensity at which an athlete must be training to break the aerobic threshold is 70 per cent of their maximal heart rate. If the above example were applied, then the 20-year-old athlete would need to have a heart rate of 140 beats per minute to gain aerobic improvement. The second anaerobic threshold would be passed when the athlete's heart rate surpassed 80 per cent of their maximal heart rate or 160 beats per minute. The passing of the anaerobic threshold

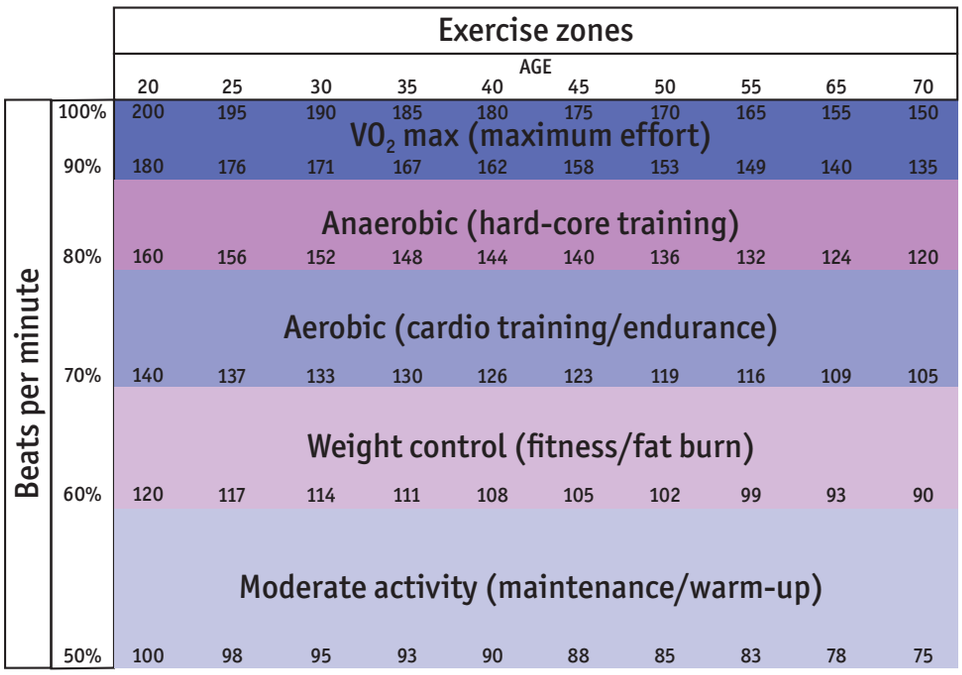

Figure 2.48 Aerobic and anaerobic heart rate zones

is also characterised by a sharp increase in the production of blood lactate. This is referred to as the lactate inflection point. Blood lactate and maximal **oxygen uptake** (VO_2 max) provide a very accurate measurement of when thresholds are crossed and the intensity of exercise. To measure blood lactate and VO_2 max, laboratory-grade equipment is required. However, heart rate can be measured using an unobtrusive heart rate monitor or simply by finding a pulse and counting the number of beats per minute.

oxygen uptake the amount of oxygen being taken into the working muscles per minute

An athlete can perform in the aerobic zone for considerably longer than they can in the anaerobic zone. As a by-product of training on or above the anaerobic threshold, the body will produce lactic acid, which causes fatigue and minimises the length of time at which that level of intensity can be maintained. The more an athlete can train above the anaerobic threshold, the more tolerant they will become of the lactic acid, and the longer they will be able to sustain the increased effort.

Warm-up and cool-down

The warm-up and cool-down are two very important components of any training session or competition. The warm-up should precede any form of training or competition. A good warm-up prepares the body for the rigours of training or competition by increasing the range of movement around joints, elevating the heart rate, allowing for skill rehearsal, and honing the focus and concentration of the athlete. By doing this, athletes minimise their risk of injury, and physically and psychologically prepare themselves. A warm-up should include the following components:

- **Aerobic activity.** A light jog is a good way to start. This gradually increases the exercise intensity and the body temperature.
- **Specific flexibility exercises.** Stretching should not be done until there has been some movement in the muscles. Stretching cold muscles can cause injury. The value of stretching is often debated, but the stretching of muscles specific to the activity is advisable. Keep the static stretching components reasonably short, focusing more specifically on dynamic exercises that are related to the upcoming activity.
- **Skill rehearsal.** The warm-up should also include some skills applicable to the upcoming activity – for example, basketball players should dribble, pass, catch or shoot.

The cool-down immediately follows the main body of exercise. The cool-down phase is often overlooked, but is particularly important for those athletes who must quickly return to training and/or who have their next competition shortly afterwards. While exercising, the body creates by-products like blood lactate, and sustains many small tears in the muscle fibres. By engaging in an active recovery or cool-down, the fresh, oxygen-rich blood can circulate more easily, helping to flush out the by-products and repair the small tears. A cool-down should involve aerobic movement (light jog and/or brisk walk) and some gentle static stretching.

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Summary 2.10

1 Define progressive overload.
2 What is specificity?
3 What is the principle of reversibility?
4 How can a coach provide variety while maintaining all other principles of training?
5 What is the aerobic threshold and what occurs if you exceed it?
6 What is the anaerobic threshold and what are the benefits of training around this mark?
7 Discuss the importance of a warm-up and cool-down.

Checklist 2.11

1 How can the principles of training be applied to aerobic training?
2 How can the principles of training be applied to resistance training?

Figure 2.49 Common training motivations

Physiological adaptations in response to training

Driving questions 2.12

1 When a person undertakes a thorough and regular training program, what are some of the major changes that occur to the body?
2 Why do these changes occur and what is the benefit of them?

At the heart of physical activity is the desire to reap the many benefits that are associated with it. These benefits can have a positive impact on all facets of a person's individual health.

For people wanting to improve their physical conditioning and performance in competitive sporting events, training enables them to positively impact their body in a range of unique ways.

These broad performance goals rely on unique physiological changes or adaptations that occur within the related systems of the human body, such as the cardiovascular, nervous and muscular systems. These adaptations are the result of a training stimulus that causes the human body to adapt, change and become more efficient. In doing so, the body is responding to the stimulus in a way that ensures it is better able to endure or cope with the physical stress being asked of it.

Obviously, there is a close relationship between the principle of training, progressive overload and the physiological adaptations that occur in response to training. For such an adaptation to occur, the stimulus must be greater than what the body is already accustomed to, otherwise the human body will remain largely unchanged.

To achieve these changes and adaptations, a specific, focused and individually tailored training program is required. As greater amounts of scientific data and more training innovations are developed in the areas of strength and conditioning, it can be a complex task to develop a training program that will safely and effectively help a person reach their desired performance goals. The most relevant physiological adaptations are:

- **resting heart rate**
- **stroke volume** and **cardiac output**

resting heart rate the number of times a person's heart beats per minute while at complete rest

stroke volume the volume of blood ejected by the left ventricle of the heart during each systemic contraction, measured in millilitres per beat

cardiac output the volume of blood ejected by the left ventricle of the heart per minute, generally measured in millilitres per minute

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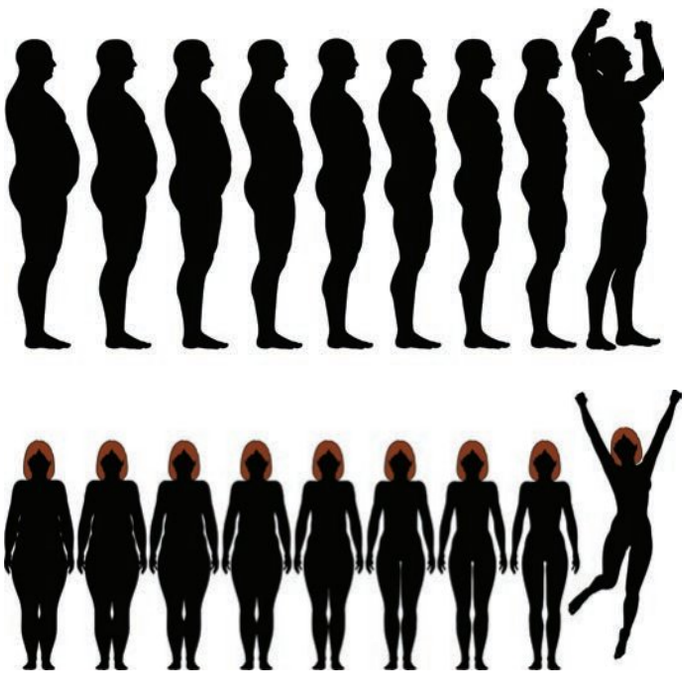

Figure 2.50 The benefits of physical activity can have a positive impact on all facets of a person's individual health

- oxygen uptake and **lung capacity**
- **haemoglobin** level
- **muscle hypertrophy**
- effect on **fast/slow-twitch muscle fibres**.

lung capacity the volume of air capable of being drawn into the lungs as an athlete inhales

haemoglobin an iron-containing protein pigment of red-blood cells that carries oxygen from the lungs to the working cells of the body to assist in aerobic respiration

muscle hypertrophy increase in size and growth of muscle cells, leading to an increase in overall muscle size, strength and power

As each physiological adaptation is studied, links should be made with appropriate training activities and programs that will contribute to its development, as well as the principles of training.

Resting heart rate

A person's resting heart rate (RHR) is a commonly used indicator of their general physical fitness. A lower RHR indicates a strong heart, capable of pumping a greater amount of blood in fewer beats. This is the preferred condition for the human heart, and regular aerobic and anaerobic training designed to appropriately stress the cardiovascular system will lead to a decrease in resting heart rate.

Typically, an untrained adult will have a RHR of between 72 and 80 beats per minute (bpm). However, a trained adult is more likely to have a RHR of closer to 60 bpm. As cardiovascular fitness increases, RHR can become as low as 30 bpm in extremely fit athletes such as ultra-triathletes. These figures are based on averages, as some healthy people have heart rate measurements that naturally fall outside of these norms.

One of the most important measurements for heart health is not the actual RHR of a person, but the time it takes for someone's heart to return to resting values following exercise. This is known as their rate of recovery, and doctors often use this stress test on heart patients to check the health of their cardiovascular system. As their aerobic endurance improves and the heart strengthens, recovery is much faster. This is evident in elite athletes playing team sports, who are able to quickly recover following high-intensity maximal efforts.

In addition to this, athletes with greater aerobic conditioning will be able to maintain a lower working heart rate at all levels of intensity compared with an untrained athlete, except when the heart is pushed to its maximal capacity. Trained adults are able to achieve a higher maximum heart rate than untrained adults. All of these factors are evident in Figure 2.51.

slow-twitch muscle fibres a type of muscle fibre better suited to endurance activities that require a low force production over a longer duration; also known as type I muscle fibre

muscle fibres the functional components of muscles, with a unique ability to shorten and contract, leading to body movement

fast-twitch muscle fibres a muscle fibre type better suited to short bursts of explosive activity that require maximal force productions; also known as type II muscle fibre

Stroke volume and cardiac output

Endurance training involves exercising for a sustained period with an elevated heart rate. Over time, this type of training has a direct training effect upon the heart muscle itself, including both an increase in size (thicker wall of the left

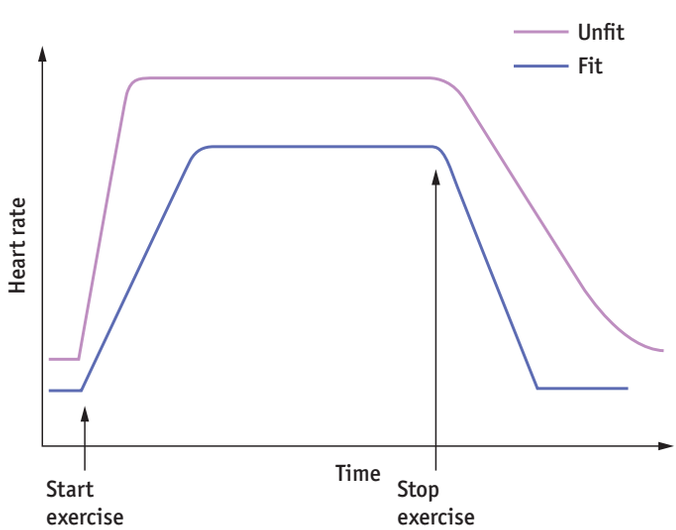

Figure 2.51 Heart rate of a fit vs an unfit athlete

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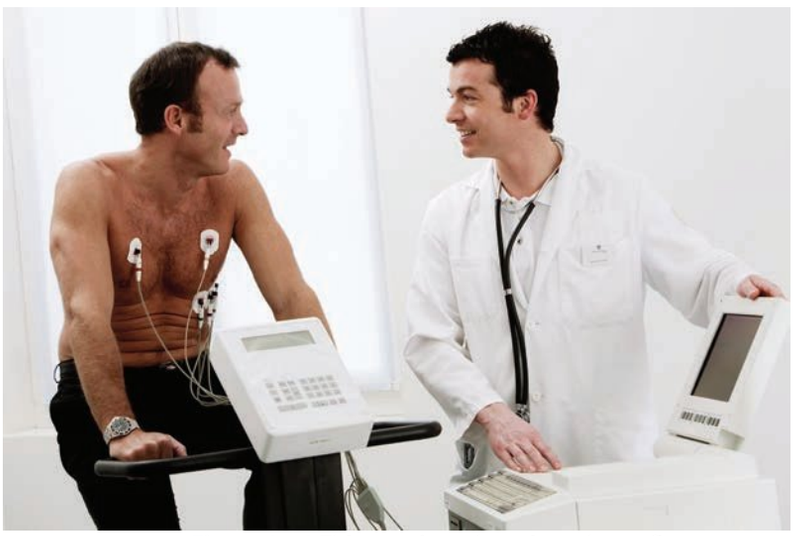

Figure 2.52 This man is undergoing a heart fitness test

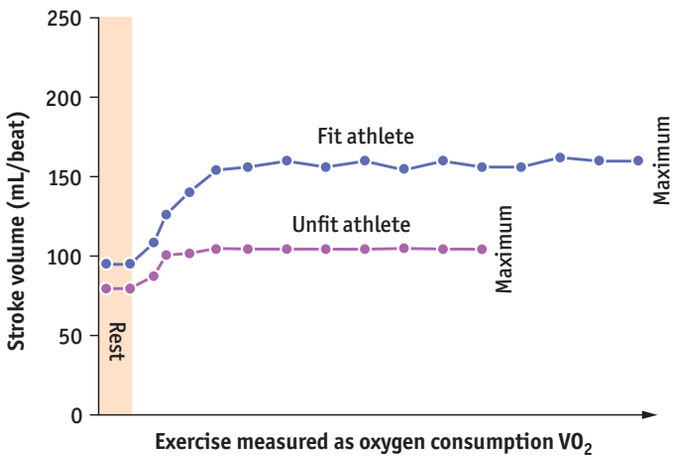

Figure 2.54 The effect of training on stroke volume

ventricle) and contractility (ability to efficiently contract repeatedly and forcefully). In addition to this, trained adults have more blood volume, to accommodate an increase in the number of oxygen-carrying red blood cells. These changes allow the heart a greater capacity to pump more blood per beat around the body by more fully ejecting the blood that has filled into the left ventricle. This is known as an increase in stroke volume. These changes all increase the body's ability to pump oxygen-rich blood to the working muscles of the body, allowing them to continue to produce energy aerobically.

Cardiovascular development through aerobic and anaerobic training results in an increase in stroke volume at all levels of work intensity. Even though stroke volume plateaus at moderate intensities, a trained adult will always have a greater stroke volume than an untrained adult. This allows the heart to beat less often to deliver oxygen to the required muscles, leading to reduced levels of fatigue. This can be seen in the graph above.

Regular aerobic training leads to a significant increase in the efficiency and capabilities of the entire cardiovascular system. Greater stroke volumes combine with a greater capacity to work at higher heart rates to produce an increase in the product of the two: cardiac output.

To calculate a person's cardiac output, their heart rate should be multiplied by their stroke volume:

heart rate (HR) x stroke volume (SV) = cardiac output (CO)

To determine the cardiac output of a healthy adult with a resting heart rate of 60 bpm and a stroke volume of 75 mL/beat, the calculation would be:

60 bpm x 75 mL/beat = 4500 mL/min

However, it is while exercising that these measurements take on greater significance, with the cardiac output increasing by four to five times

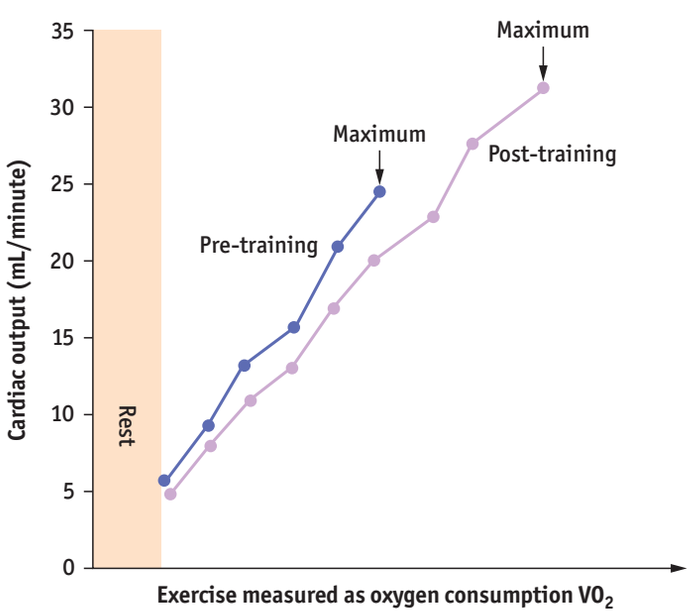

Figure 2.53 Changes in cardiac output with endurance training

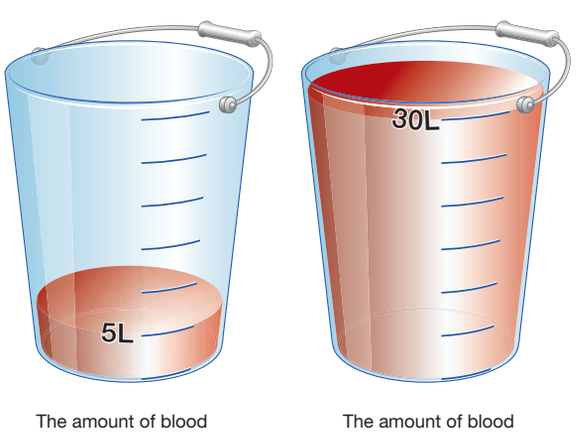

Figure 2.55 Cardiac output: rest vs work

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Figure 2.56 Three balls spirometer breathing exercise apparatus, used by athletes to measure both the depth and force of breathing

per minute. During exercise, the majority of this increased blood flow is directed towards the working muscles and away from less essential body systems, such as the digestive system. Because the trained adult has a lower working heart rate compared with an untrained athlete at a set

Figure 2.57 A woman doing a spirometry breathing test, used by athletes to measure both the depth and force of breathing

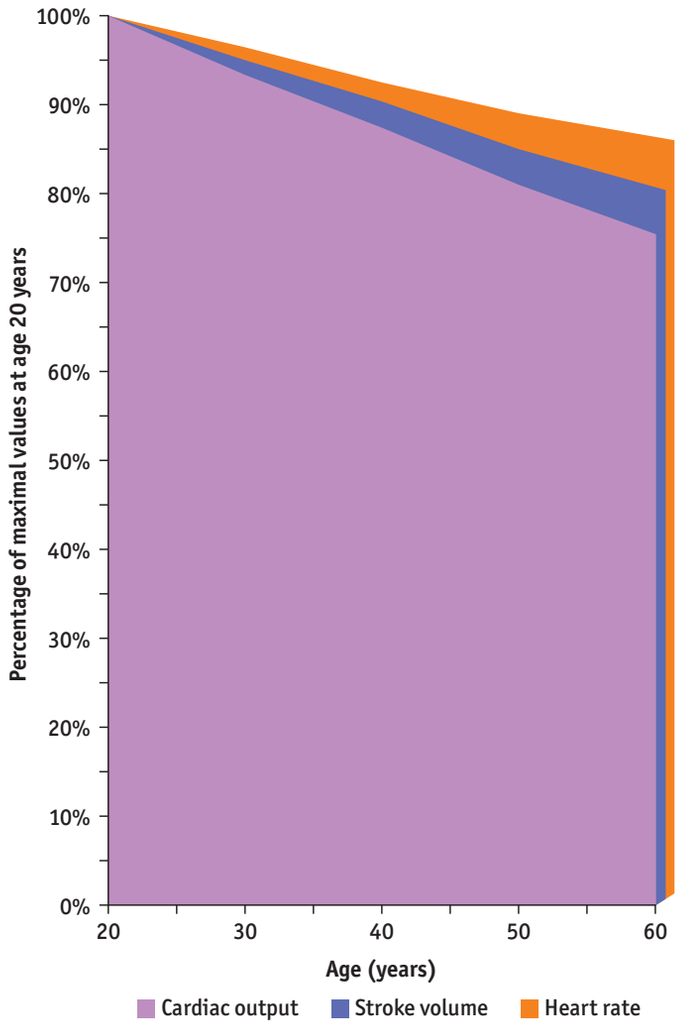

Figure 2.58 The effects of ageing on maximal values for cardiac output, stroke volume and heart rate

intensity level, the increase in cardiac output is largely attributed to an increased stroke volume. The difference in cardiac output between an untrained adult and an elite athlete can be as much as double, with extremely fit adults being able to pump 30 to 40 litres of blood out of the heart per minute.

Apart from decreasing fitness levels through reversibility, another factor that leads to a decrease in the functioning of the cardiovascular system is age. As people get older, their heart rate, stroke

Going further 2.13

Inquire

Read the article about cyclist Bradley Wiggins on the BBC Health News website (see www.cambridge.edu.au/hscpdhpe1weblinks) and identify information that relates to the material studied throughout this unit.

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volumes and therefore cardiac output all gradually decrease in capacity. For this reason, older athletes should take extra precautions when exercising at moderate to high intensities.

Oxygen uptake and lung capacity

Aerobic and anaerobic training lead to the development of both the cardiovascular and respiratory systems. The combined system is often referred to as the cardiorespiratory system, which incorporates the lungs, heart and all blood vessels. The primary role of these body organs during exercise is to provide as much oxygen as is needed or is possible to the working muscles, to ensure that they continue to work aerobically for as long as possible. If the intensity of training is high, and more anaerobic in nature – that is, short- to medium-interval training – the oxygen required is used primarily for recovery, as the body is unable to supply enough oxygen to maintain consistent work intensity due to increasing fatigue from lactate build-up. In both cases, increased oxygen uptake and lung capacity will benefit the athlete, and are a natural physiological adaptation in response to training.

Regular aerobic training results in a variety of changes to the respiratory system. The actual lung capacity may increase slightly for some adults; however, this is more likely to occur in elite endurance athletes such as road cyclists. The most significant change is in the actual amount of air that can be moved in and out of the lungs with each breath. As with the heart's stroke volume and heart rate, the lungs also develop in their capacity to draw in more air and increase the ventilation rate without necessarily getting larger. The manner in which the air is moved in and out of the lungs is more noticeable, as the lungs prefer to breathe more deeply and forcefully than to increase the

Level	Shuttles	Cumulative shuttles	Speed (km/h)	Shuttle time (sec)	Total level time (sec)	Distance (m)	Cumulative distance (m)	Cumulative time (min and sec)
1	7	7	8.0	9.00	63.00	140	140	1:03
2	8	15	9.0	8.00	64.00	160	300	2:07
3	8	23	9.5	7.58	60.63	160	460	3:08
4	9	32	10.0	7.20	64.80	180	640	4:12
5	9	41	10.5	6.86	61.71	180	820	5:14
6	10	51	11.0	6.55	65.50	200	1020	6:20
7	10	61	11.5	6.26	62.61	200	1220	7:22
8	11	72	12.0	6.00	66.00	220	1440	8:28
9	11	83	12.5	5.76	63.36	220	1660	9:31
10	11	94	13.0	5.54	60.92	220	1880	10:32
11	12	106	13.5	5.33	64.00	240	2120	11:36
12	12	118	14.0	5.14	61.71	240	2360	12:38
13	13	131	14.5	4.97	64.55	260	2620	13:43
14	13	144	15.0	4.80	62.40	260	2880	14:45
15	13	157	15.5	4.65	60.39	260	3140	15:46
16	14	171	16.0	4.50	63.00	280	3420	16:49
17	14	185	16.5	4.36	61.09	280	3700	17:50
18	15	200	17.0	4.24	63.53	300	4000	18:54
19	15	215	17.5	4.11	61.71	300	4300	19:56
20	16	231	18.0	4.00	64.00	320	4620	21:00
21	16	247	18.5	3.89	62.27	320	4940	22:03

Table 2.9 Increased performance with training

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Figure 2.59 Regular aerobic and anaerobic training leads to greater oxygen uptake, which helps ahtletes, such as football players, sustain a high power output over an extended period

ventilation rate (in a similar manner to the heart and the increase in stroke volume at submaximal intensities). The muscles that contribute to the process of breathing in and out increase in efficiency and strength, which equally contributes to increased lung capacity. Some athletes use specific breathing exercises and equipment to enhance their lung capacity.

To test lung capacity, athletes use medical-type equipment that can measure both the depth and force of breathing.

It is interesting to note that the lungs are more than capable of breathing in adequate oxygen to supply the working muscles. It is actually the efficiency of the cardiovascular system that is often the limiting factor with regard to cardiorespiratory endurance. Development in this system will contribute to greater oxygen uptake, a key physiological adaptation to regular aerobic training.

From deep sleep to high-intensity activity, our bodies have an oxygen demand that needs to be met. As the body's ability to draw oxygen into the muscle cells is increased through regular training, the athlete will be able to sustain a higher average power output over an extended period, whether it is through running, swimming, cycling or rowing. Testing oxygen uptake can be difficult without the use of technical equipment capable of measuring the amount of oxygen and carbon dioxide being inhaled and exhaled with each breath. However, maximal tests, where the athlete works to absolute exhaustion, can be a reliable measure of the maximum amount of oxygen that an athlete is able to draw into the working muscles per minute. This is commonly referred to as VO_2 max, which is measured in millilitres of oxygen per kilogram of body weight per minute. The popular multi-stage fitness test (also known as the beep test) and yoyo test both have prediction tables of maximal oxygen uptake, which is a respected measurement of aerobic fitness.

The health benefits of an effective and efficient cardiorespiratory system are just as important as the performance benefits for athletes. Reduced risk of cardiovascular disease, type 2 diabetes and being overweight are all positive outcomes of regular training that stimulates the aerobic system to adapt to a suitably difficult training load.

However, all sportspeople benefit in some way from being aerobically fit. Archers with a lower resting heart rate can calmly shoot between heartbeats; netball centres are able to recover faster after successive and intense bursts of activity; marathon runners can sustain a greater pace over the course of the entire race. The training principles of progressive overload and specificity are essential to ensure that these adaptations continue. Training at the appropriate threshold of intensity, as well as using the type of training needed, will specifically develop the required energy systems for a particular sport. Also, reversibility is very relevant with regard to oxygen uptake. An athlete who stops or slows their volume and intensity of training will quickly notice a decrease in aerobic and anaerobic performance. Consider an athlete following an injury, and the noticeable loss of reported fitness and endurance.

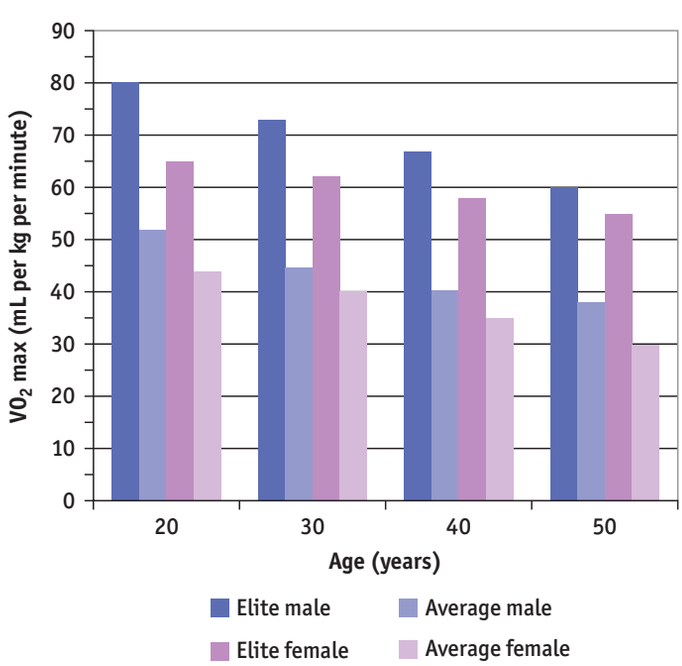

Figure 2.60 Male and female elite athletes have significantly higher maximal oxygen uptake values than average individuals

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NEWS SPORT BUSINESS WEATHER

Nick Walshaw puts himself through the rigours of a VO_2 max test

By NICK WALSHAW
16 July 2012

Figure 2.61 A typical VO_2 max test

Sports boffins simply refer to it as the sheet.

An unassuming slip of A4 paper which, for the best part of 18 years, has stuck to a wall here among the white coats, red lights and pinging machines that comprise the Australian Institute of Sport physiology department.

According to senior physiologist Hamilton Lee, present that glorious day the sheet came into being, it's something like a sports science version of Picasso's *Weeping Woman*. Or a Monet. The greatest $V0_2$ max test ever completed.

'And I can still remember Cadel Evans setting it,' he says, looking down at me collapsed in a rancid mix of my own perspiration and failure. 'Back then, Cadel was an unknown mountain biker on scholarship here.

'But from the moment he hopped on to this same bike, yeah, he lit it up. Produced a printout that's never been beat. But as for yours … ahh … has the editor insisted you publish this?' Sadly, he has.

He's convinced the best way for *The Daily Telegraph* to unveil our 2012 Olympic team – a mob of 410 athletes which includes our reigning Tour De France champion – is to have this overweight muppet join them in final preparations.

Spending more than a month copping punches, pulling hamstrings, sweating rivers. Kicked so badly by taekwondo fighter Safwan Khalil, my beloved beer belly will stay bruised for 12 days.

But before all this, a fitness check. Which is how, after signing a declaration waiving the AIS of all responsibility should I die, this hack finds himself inside a laboratory – pedalling harder than an Indian street hawker while breathing through a snorkel-like mouthpiece.

Blood taken from my left hand every three minutes, too.

The VO_2 max test is the ultimate way of determining your motor. And it's done by keeping an exercise bike, which increases in resistance every three minutes, around 80 revs until the point of exhaustion.

'Like red-lining a car,' Lee explains as, with only minutes gone, my breathing already sounds like Darth Vader's.

'This test, there's none better for determining aerobic capabilities, cardiovascular fitness and …'

Pausing, he then turns to *The Daily Telegraph*'s photographer, setting up a light stand nearby.

'You'd better hurry up with that,' he says. 'I can't see this going long.'

It doesn't.

When Evans did this same test over 30 minutes back in 1995, he recorded that record result of 87.

'And a quick look tells me it's not going today,' Lee says. 'Although, to be fair, you are the first journalist we've ever allowed on this machine … and the first I know of who's done it in boardies.'

Not that Billabong can be blamed for what follows.

According to data, an untrained young male's VO_2 max reading should be 45. Young untrained female, 38. Yet when I almost fall from the bike with just 16 minutes gone … well, the result is an embarrassing 35.

'Which is good for a woman in her 30s who doesn't get outside a lot,' Lee laughs. 'Of course, the other thing with Cadel was the phenomenal way he recovered. Even moments after the test was done he looked better than … well, certainly better than you down there.'

Source: The Daily Telegraph (see www.cambridge.edu.au/hscpdhpe1weblinks)

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Haemoglobin levels

The red blood cells (RBC) are the formed component of blood responsible for transporting oxygen. Each RBC is comprised of over 200 million molecules of haemoglobin, making up 97 per cent of its volume. Oxygen diffuses across the semi-permeable membrane in the lung's alveoli, to be picked up by the haemoglobin in the RBC. This oxygen-rich blood is then transported to the heart, to be pumped all around the body for use in aerobic respiration.

Aerobic or endurance training leads to an increase in RBC count, and therefore total haemoglobin levels in the body. This increased oxygen-carrying capacity will enable the athlete to maintain a higher average pace and power output, as the body can increase its oxygen uptake. Haemoglobin levels can be increased by over 20 per cent as a response to training.

Such is the advantage of increased haemoglobin levels that athletes and sports scientists have spent considerable time, effort and money to discover ways of naturally and artificially increasing an athlete's RBC count. The illegal use of artificial erythropoietin (EPO), which is derived from a naturally occurring hormone in the body that stimulates RBC production, has received much media attention over the last decade, particularly in the Tour de France. Blood doping, using either the athlete's own or donor's blood to temporarily increase RBC count, is another illegal method used in endurance sports. Legal methods include training in a hypoxic environment, where oxygen concentration in the air is low. This stimulates the body to increase RBC production to account for the lower levels of oxygen available in the air. This can be achieved by either training and living in a high-altitude location, or by spending time in an enclosed hypoxic tent that mimics these conditions.

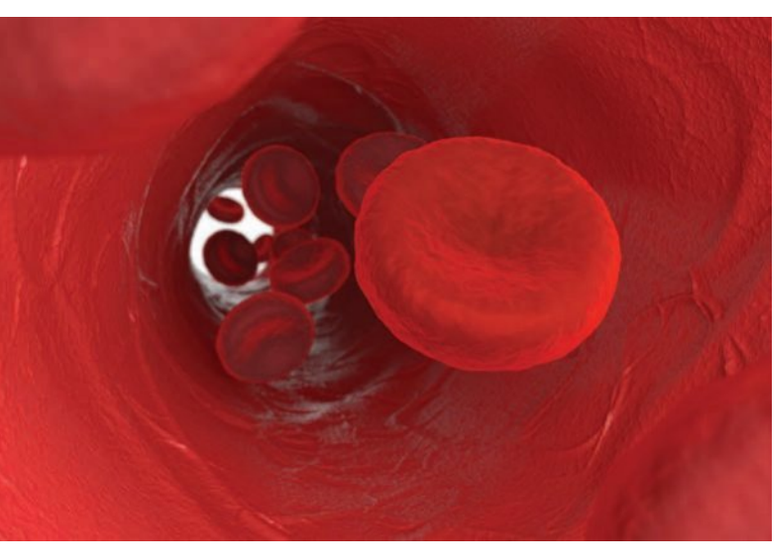

Figure 2.62 Microscopic view of blood

Figure 2.63 Time trial cyclist

While the effect is temporary, the effect can provide a distinct short-term advantage to an endurance athlete.

Generally, aerobic training can increase haemoglobin levels by over 15 per cent. However, increased blood viscosity (thickness or density) from higher concentrations of red blood cells

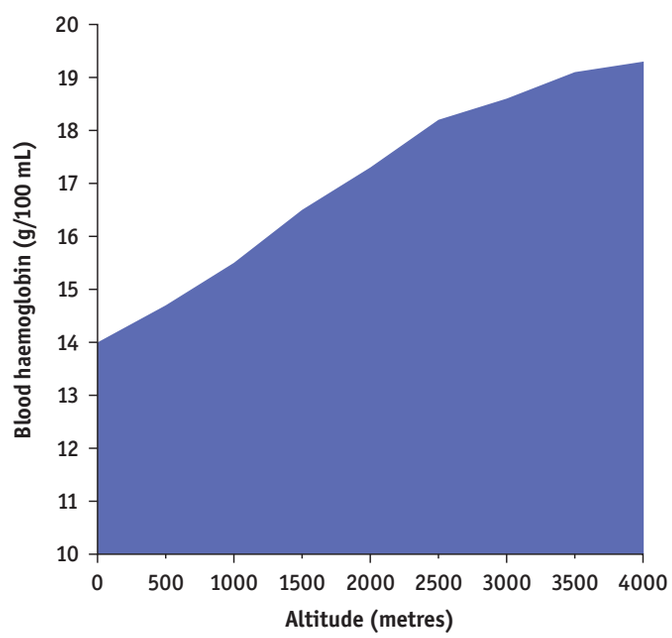

Figure 2.64 The effect of altitude on haemoglobin levels in males

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Figure 2.65 Specific resistance or weight training targeted towards increased muscular bulk and strength leads to specific changes within a muscle's structure

is offset by an increase in total blood volume – particularly blood plasma, which is the liquid component of blood.

Muscle hypertrophy

Many athletes and non-athletes desire bigger bodies and increased musculature. Maintaining strong muscles is also an important contributor towards healthy ageing, and many older adults are encouraged to participate in regular and safe resistance training. However, increasing the actual size of a person's body requires a very disciplined, demanding and regular training program, aimed at stimulating the muscles in such a way that they are forced to grow in order to cope with the training stimulus. Many people participate in forms of resistance training that do not necessarily lead to increased muscle size, but do increase the tone of their muscles and improve muscular endurance. Similarly, aerobic or endurance training, which may increase the tone of muscles and their definition by decreasing body fat and increasing the appearance of lean body tissue, will not have a hypertrophic effect on the body.

Figure 2.67 Diagram of muscle structure

Specific resistance or weight training targeted towards increased muscular bulk and strength leads to specific changes within a muscle's structure, as well as other related body systems:

- The stimulation of the nerves that innervate a particular muscle increases their ability to quickly stimulate a muscle to contract, which is known as their excitability.
- Connective tissues, such as the tendons and bone attachments that enable a muscle to move a particular limb, are thickened and strengthened to prevent injury. This also leads to increased bone strength and density, which is why strength training is so important for adults of all ages.
- Within the actual muscle, increased size and amount of muscle cells relate to increased cross-sectional thickness, not length. Actin and myosin filaments, which produce the sliding or contracting action of muscles, increase their mass, leading to the hypertrophy of the

Figure 2.66 Increasing the size of a person's body requires a very disciplined, demanding and regular training program

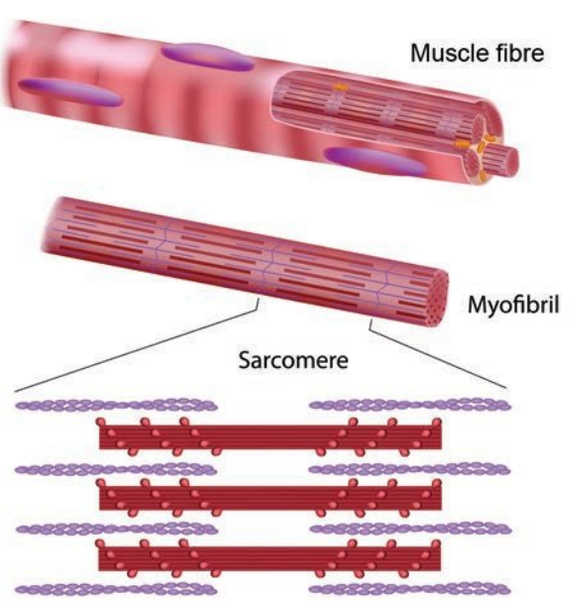

Figure 2.68 The structural organisation of muscle tissue, from the muscle belly, to a muscle fibre, to a myofibril, which consists of the actin and myosin filaments

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Figure 2.69 Progressive overload is a fundamental requirement for muscle hypertrophy

myofibrils, the elongated contractile threads that make up skeletal muscle and give it its striated (or striped) appearance.

A number of principles of training stand out as being essential for muscle hypertrophy:

- **Progressive overload.** This is a fundamental requirement for hypertrophy. The muscles must work harder than they are accustomed to doing. This means training has to be sufficiently challenging to force the muscles to have to adapt to the increased load being placed upon them. For example, if an athlete could comfortably bench press a set weight eight times, the load should be increased slightly until it is very challenging to complete eight reps without some minor assistance in the last rep. This process must occur gradually to prevent injury. Also, training must maintain regularity, with each major muscle group exercised at least once or twice each week.

Figure 2.70 A person's somatotype, or bodyshape, will determine their ability to increase muscle bulk

- **Specificity.** If an athlete is training for a particular sport, the movements and muscles trained should relate to the sport. For example, a shot putter must have significant development around the shoulder girdle, leading to variations of bench and shoulder presses being important movements. Specificity also relates to the design of training programs. In short, training should consist of heavier weights and lower repetitions. If the load is too light, muscular endurance will be increased without noticeable increases in the size of muscle.
- **Variety.** Muscles quickly become accustomed to a particular training regime, and gains will slow or plateau if a variety is not evident within a training program. Athletes should use a variety of exercises that stress a muscle from different angles. For example, bench presses should be completed on inclined, flat and decline benches, as well as the athlete doing flies and dumbbell presses to more fully develop the pectorals. Programs should be gradually altered every four to six weeks to produce continued growth.
- In addition to this, thorough **warm-ups** are necessary and **reversibility** will quickly set in, as evidenced by muscle **atrophy** and loss of strength.

atrophy decrease in muscle size due to a lack of training stimulus

It is worth noting that an athlete's ability to increase muscle size is largely genetically determined. A higher degree of fast-twitch muscle fibres, which are more suited to power based sports, will enable increased growth as they have a greater capacity to increase in size than slow-twitch muscle fibres. Also, higher levels of testosterone produce an androgenic effect on the body, where it has a greater capacity to grow. This is why males who have higher rates of testosterone are able to build more muscle. A person's body shape, known as their somatotype, will also determine the degree to which a person is able to increase muscle bulk. A mesomorphic body shape, which has a strong genetic disposition, will enable greater gains from heavy resistance training.

Effect on fast/slow-twitch muscle fibres

There are TWO major types of muscle fibres found in muscle tissue:

- **slow-twitch muscle fibres (ST)** – also known as type I or red muscle fibres
- **fast-twitch muscle fibres (FT)** – also known as type II or white muscle fibres.

It is now commonly recognised that FT or type II can be further categorised into:

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Background information on muscle fibres

The muscle fibres that make up a single muscle – for example, the bicep – are individually stimulated to contract by a particular neuron or nerve, which is known as a motor unit. The number of motor units fired depends upon the actual movement and the intensity of the activity. The motor unit recruitment theory suggests that for low-intensity work, ST fibres are recruited first, followed by FT as the stimulation increases due to a greater intensity of effort. Therefore, the human body has a complex ability to switch on and utilise only the minimum amount of muscle fibres needed to produce a set movement. It can therefore distinguish which particular muscle fibres should be used, depending upon the intensity of the effort.

Because each type of muscle fibre has unique characteristics and capabilities, this makes them more advantageous or useful in specific situations or at particular intensities of activity, as the body can utilise the fibre type that is best suited to the particular activity.

However, it is recognised that the composition or individual makeup and percentage of each muscle fibre type is predominantly genetic – a hereditary and non-modifiable individual characteristic. The most accurate way to assess an individual's muscle fibre composition is to take an invasive muscle biopsy to be examined under a microscope. Some tests have been developed that can be used as a predictor of muscle fibre composition. One such test is described below.

> Establish the 1RM (the greatest weight that they can lift just once) of an athlete performing a particular movement (extreme caution should be exercised here due to the high exertion required). They should then perform as many repetitions at 80% of 1RM as possible.
>
> If more than 12 repetitions can be performed, then the muscle group has more than 50% Type I ST fibres.
>
> If less than 7 repetitions is all that is possible, the muscle group is likely composed of greater than 50% Type II FT fibres.
>
> If the athlete can perform between 7 and 12 repetitions, the muscle group most likely has an equal proportion of fibres. (Pipes, 1994).
>
> Karp, J.R, *Muscle Fiber Types and Training*, Track Coach #155.

Another way to indirectly determine a person's muscle fibre makeup (especially a younger person) is to review the range of sports at which they excel, comparing activities of varying activities from longer distance endurance events to more explosive maximal events. Strengths in a particular area will possibly indicate the person's compositional makeup.

- **type IIa** – an intermediate fibre, displaying characteristics of both slow- and fast-twitch muscle fibres, where specific training can make it seem more like either ST or FT fibre
- **type IIb** – a more pure or classic fast-twitch fibre suited to maximal power production.

Slow-twitch muscle fibres

These are also described as red muscle fibres because of their high blood supply, being provided by the increased number of blood capillaries present (which can be seen in Figure 2.73, where the ST fibres are darker in colour). This increased

Figure 2.71 Usain Bolt – sprinter

Figure 2.72 Mohamed 'Mo' Farah – distance runner

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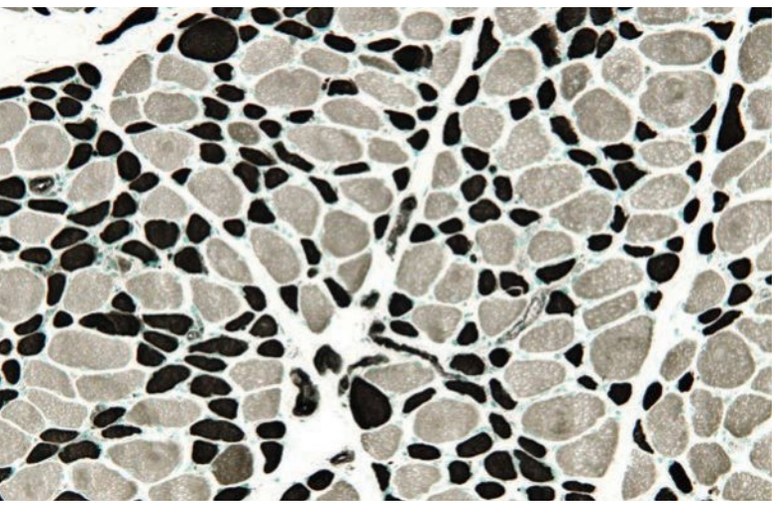

Figure 2.73 Microscopic view of muscle fibres

surface area allows for greater gaseous exchange – primarily oxygen into the working muscle and carbon dioxide removal. As a result, type I ST muscle fibres are adapted to use oxygen more efficiently and work aerobically. They contract slowly and release energy gradually as required during endurance activities over a longer duration, such as jogging, cycling or swimming. They are more efficient in the use of fats as a fuel source during exercise at a comfortable steady pace. This promotes glycogen sparing and conservation, in preparation for periods of higher intensity efforts. They are fatigue resistant at submaximal intensities; however, overall power output is low.

Sports that are better suited to athletes with higher percentages of ST fibres include:

- marathon running
- long-distance swimming
- ultra-ironman triathlons.

Key characteristics of type I ST muscle fibres (in comparison to type II FT muscle fibres) are:

- a greater number of capillaries and therefore blood supply, promoting greater oxygen supply
- the metabolisation of ATP at a slower rate
- increased amounts of mitochondria, the organelle in muscle cells responsible for aerobic energy production
- increased amounts of myoglobin, which plays a similar role to haemoglobin in storing and transporting oxygen within the cell to the mitochondria for aerobic respiration and energy production
- increased amounts of oxidative enzymes to assist with aerobic energy production.

Obviously, aerobic-based endurance training will have the greatest impact upon type I ST fibres.

Specific physiological adaptations in response to aerobic training include:

- an increase of over 15 per cent in the number of muscle capillaries
- increased myoglobin stores to support the increased oxygen supply
- increased size, efficiency and amount of mitochondria, accounting for greater aerobic capacity
- some increase in hypertrophy, often seen as an increase in lean muscle mass and tone.

Fast-twitch muscle fibres

These are often described as white muscle fibres. Because type II FT fibres largely rely on anaerobic pathways – that is, without the need for oxygen – the body does not need to supply these fibres with a rich source of blood and oxygen – hence the difference in colour between the two types:

FT fibres have significantly greater power and force production, with greater resistance to short-term fatigue during anaerobic activities. However, if the activity lasts for more than a minute or so, these fibres fatigue quickly due to the decreased oxygen supply.

Sports that are better suited to athletes with higher percentages of FT fibres include:

- sprints (100 to 400 metres)
- shot put
- weightlifting.

Key characteristics of type II FT muscle fibres (in comparison to type I ST muscle fibres) include:

- fewer capillaries (therefore blood and oxygen supply) and fewer mitochondria
- more fuel for anaerobic energy pathways, namely creatine phosphate and ATP
- the metabolisation of ATP at a faster rate
- increased amounts of glycogen
- larger motor units and neurons that stimulate FT fibres, capable of faster and more powerful stimulation, described as increased excitability and contractility

Going further 2.14

Communicate

There are two major types of muscle fibres – red and white.

1. **Why do you think they are described in this way?**
2. **Based on this answer, make some assumptions about each type of muscle fibre's possible features, characteristics and capabilities.**
3. **Share your thoughts with another person, and then with the rest of the class.**

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- increased glycolytic enzymes to assist with the fast metabolism or breakdown of glycogen in the absence of oxygen.

Training methods that target FT fibres depend upon the specific nature of the sport. Medium to heavy resistance training, aimed at increasing power, strength or muscle bulk, will lead to specific adaptations. Likewise, anaerobic training, using short intervals where anaerobic pathways are utilised, will also lead to development of type II FT fibres.

Specific physiological adaptations in response to anaerobic training (either resistance or short intervals) include:

- increased stores of ATP, creatine phosphate, glycogen and glycolytic enzymes, all leading to increased production of ATP from anaerobic energy pathways
- increased synchronisation and coordination of motor unit recruitment, leading to increased neural activation, and therefore greater force and power production
- considerable potential for muscle hypertrophy with specific training programs, focusing on heavy resistance training
- greater tolerance to increased muscle acidity and more efficient lactate clearance
- some increase in hypertrophy, often seen as an increase in lean muscle mass and tone.

As mentioned earlier, type II FT fibres can be categorised into either type IIa or type IIb. Type IIb is a purer or more classic version of fast-twitch muscle fibres, and the previous description is very accurate for these. However, type IIa requires some further explanation.

These are often described as intermediate fibres, because they contain characteristics of both fast- and slow-twitch muscle fibres. They have increased capillary supply and mitochondrial function compared with type IIb fibres, but also an increased amount of anaerobic capacity compared with type I fibres. They can produce higher power outputs over a longer period, and can recover in shorter amounts of time due to their increased oxygen supply. From a training perspective, type IIa fibres will respond specifically to the type of training being performed. Therefore, they take on characteristics and capacities of either type I ST or type IIb FT, depending upon the training stimulus. For this reason, they can be described as being interchangeable, capable of enhancing either the aerobic or anaerobic power of the athlete. People with higher percentages of type IIa fibres are very adaptable athletes, who succeed in sports that require a mix of both energy systems, such as AFL, netball and general classification cycling, where riders must have endurance to climb mountains as well as ride fast in a time trial.

Another interesting feature of the human body's muscle fibre composition is the difference in the various muscle groups in the body. Postural and supportive muscles that are consistently used in everyday activities are more ST in profile – for example, core abdominal muscles (transverse

Going further 2.15

Communicate

Review the article on building a Tour de France-winning body on the SBS website (see www.cambridge.edu.au/hscpdhpe1weblinks) and summarise the ideal muscle fibre composition of a Tour de France rider. Then, for a selected sport, describe the ideal muscle fibre composition.

Going further 2.16

Collaborate

In small groups and on a large piece of paper, select a sport or famous athlete. Make links between this sport or athlete and the syllabus dot points. Use the mind map in the figure below as a guide. Some research may be required. Aim to include as much information and examples as possible to make your understanding of the syllabus content visible.

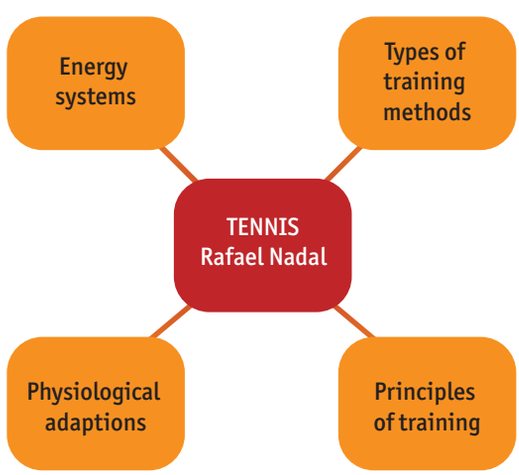

Figure 2.74 Syllabus dot points guide relating to tennis and tennis player Rafael Nadal

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abdominus) and calf muscles (soleus). Leg muscles such as the quadriceps (rectus femoris) and shoulder muscles (deltoid) are typically used for more powerful movements, so are more FT dominant.

Summary 2.17

Outline the physiological adaptations that occur to the following in response to training:

- **resting heart rate**
- **stroke volume**
- **cardiac output**
- **oxygen uptake**
- **lung capacity**
- **haemoglobin level**
- **muscle hypertrophy**
- **fast-twitch muscle fibres**
- **slow-twitch muscle fibres.**

See the following articles on athletes who are particularly well suited to their sports:

- 'Butterfly king: Michael Phelps' reign explained', *The Telegraph*, (see www.cambridge.edu.au/hscpdhpe1weblinks)
- 'Why you're not an Olympian: Athletes built for their sports', *ABC News* (US), (see www.cambridge.edu.au/hscpdhpe1weblinks).

Checklist 2.18

Describe the relationship between the principles of training, physiological adaptations and improved performance.

Figure 2.75 American swimmer Michael Phelps has been referred to as the 'Butterfly king'

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2.2 The impact of psychology on performance

Driving questions 2.19

'Make sure your worst enemy doesn't live between your own two ears.' Laird Hamilton

1 How important do you think a player's psychological state is in determining success?
2 Identify examples of when mental strength either won or lost a game. Do you think you can ever win without being mentally strong?

Motivation

A unique feature of the sporting environment is the high degree of competitiveness and public exposure – something with which most people do not have to deal on a day-to-day basis. Highly motivated athletes train more intensely and are more driven to succeed when competing. The critical nature of motivation is most clearly evident when an athlete is suffering from a lack of motivation, where they may:

- seem generally unhappy, distracted and less interested in training or competing
- be unable to push themselves to the same degree during high-intensity training
- experience a decrease in performance level
- be experiencing strained relationships with those around them
- be experiencing higher degrees of anxiety and stress.

Sometimes athletes are unaware of declining motivation levels until their performance starts to suffer. They may find it difficult to measure, assess and increase their own motivation. Coaches and sports psychologists can play a significant role in helping to establish healthy thought patterns and motivational factors that can lead to increased motivation.

A wide variety of incentives and disincentives can lead to increased motivation of an athlete. All athletes have unique personalities, and therefore respond in a different manner to these. Coaches need to be sensitive to the individual athlete, and to ensure the motivational factors driving the athlete will have the greatest impact. This can be particularly challenging in a team situation, where different personalities exist. This can be a source of frustration for athletes, even prompting them to seek a different coach or team they feel will be more beneficial for their development.

Positive and negative motivation

negative motivation any motivational factor that is perceived as undesirable and as something to be avoided

positive motivation any motivational factor that is perceived as desirable and as something worthy of personal investment to achieve

There are two broad types of motivational factors: **positive** and **negative motivation**. Positive factors instil a sense of drive in an athlete to achieve their goals, because of the variety of positive outcomes that could result from success. These could include:

- financial rewards
- representative team selection
- the desire to win the gold medal or grand final
- the adoration of fans
- a renewed and improved contract
- a competitive desire to beat all others and win for personal satisfaction
- a drive to achieve a personal best and to fulfil their potential.

Negative factors act as a deterrent, and often will compel an athlete to greater efforts for fear of the negative outcome. These could include:

- being dropped from the team or losing a contract
- losing and suffering the perceived humiliation or embarrassment of defeat
- not achieving what they believe to be their full potential
- threats by the coach to do extra or more intense training sessions.

Like most people, athletes generally respond more favourably to positive motivation throughout life. However, there are times where negative motivation can be used as a powerful force to drive an athlete towards success. This can vary between individuals, and coaches must be aware of the situation so motivational factors can be used most appropriately.

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Summary 2.20

1 Write some examples of self-talk mantras that an athlete could habitually repeat to themselves to positively increase motivation.
2 Classify the following examples into the categories below:
   - praise from coach, offer of a bigger contract
   - fear of not getting a renewed contract
   - fear of being dropped from the team
   - winning gold
   - worried about disappointing family
   - desire to win
   - satisfaction of achieving personal best
   - fear of not living up to expectations of supporters
   - fame and popularity.

Positive/intrinsic

Negative/intrinsic

Positive/extrinsic

Negative/extrinsic

3 Analyse your current motivations for your efforts in the Higher School Certificate. What types and source of motivation could you take on board that would drive increased commitment and efforts in your studies?

Checklist 2.21

Evaluate performance scenarios to determine the appropriate forms of motivation – for example, golf versus boxing.

Intrinsic and extrinsic motivation

There are also two sources of motivation: **intrinsic motivation** and **extrinsic motivation**. The internally (or intrinsically) motivated athlete is almost self-propelled towards success and hard work. They have personal goals, expectations and fears that drive their efforts and commitment. These motivating factors are intensely personal, and are often driven by an athlete's high level of competitiveness and desire to succeed and win.

extrinsic motivation any motivational factor that is derived from an external source

intrinsic motivation a motivational factor that is derived from within the athlete's own thought patterns

Extrinsic goals can be either positive or negative in nature. It is advised that athletes should focus more on extrinsic goals from a reliable and controlled source, such as a coach. While playing for the adoration of a crowd can be a powerful influence to play hard, negative feelings of embarrassment may follow if the support stops or turns negative. This can lead to other psychological barriers to successful sporting performance, such as increased anxiety.

Sports psychologists generally aim to empower athletes to be able to monitor and positively influence their own levels of motivation. By setting personal goals and positive incentives, the athlete is able to remain focused and is driven to work hard. A key aspect of developing this power is for the athlete to closely observe and control their self-talk, to ensure their thought patterns are positive and beneficial.

Anxiety and arousal

Trait and state anxiety

The immense pressure an athlete faces during elite competition can challenge the athlete's mind almost as much as the physical demands of the sport. Even as spectators and fans watch their favourite athletes and teams compete, they can feel the pressure, with increased feelings of anxiousness and nervousness, as well as increased heart rate, breathing and body temperature. However, these

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Going further 2.22

Communicate

Is anxiety something with which all elite athletes have to deal, or is it more likely that elite athletes have reached such a high level of success because of an innate or natural ability to deflect or even not suffer from anxiety? Discuss this as a group.

Figure 2.76 Anxiety and stress can have a negative impact on performance

challenges can extend beyond the game, as the athlete may have to deal with feelings of anxiety outside of competition. If dealing with anxiety becomes a daily struggle, then athletes are as exposed to mental health disorders, such as anxiety and depression, as any other person.

state anxiety feelings of anxiety related to a specific game or event

trait anxiety the genetic predisposition and proclivity an athlete has towards increased anxiousness and nervousness

Increased anxiety levels can be detrimental to the performance of all athletes. There are two categories of anxiety that athletes will need to learn to handle: **state anxiety** and **trait anxiety**.

All people have unique and individual personality characteristics. Some people may carry greater levels of anxiety throughout life, over any number of daily events. For athletes with higher levels of trait anxiety, the increased pressure of elite competition can present an even greater mental obstacle to success.

The nature of competition inherently leads to increased pressure on the athlete to perform to the best of their ability. Some sports place a great deal of pressure on an athlete to perform very precise movements with only a small degree of error allowed, such as shooting and archery. In other sports, there are certain aspects where the pressure on the athlete increases, such as a free throw in basketball. Success is entirely reliant on the athlete being able to control their nerves and execute the skill accurately. In all sports, state anxiety will increase as the level of competition rises, eventually culminating in either a grand final or a gold medal match. In a situation where an athlete has to execute a single skill that they have practised for four years leading up to the Olympics, only the most controlled and focused athletes will be able to prevent state anxiety from impacting upon their performance.

Both state and trait anxiety can negatively impact upon performance. Some of the signs that athletes report when suffering from increased anxiety include:

- feelings of 'stomach butterflies', even to the point of vomiting prior to competition
- constant feelings of tension and being unable to relax, which can lead to increased feelings of fatigue

Going further 2.23

Create

1. **Reflect on the times you have felt the most nervous and anxious. Share with the class how this felt, and describe the impact it had on your state of well-being and ability to perform under pressure.**
2. **Watch some sports footage, where an athlete had to remain focused and the pressure to perform was immense, but ultimately they failed (in colloquial terms, choked). Write a mock journal entry about the thoughts this athlete may have been having prior to executing the unsuccessful skill, and the thoughts immediately after. Discuss the impact that this may have on similar situations in the future, and make some suggestions about how these could be minimised.**

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- prior to a game, feeling very twitchy – their legs may seem uncontrollably shaky or they may pace around the room
- muscles becoming tense, leading to increased errors. This can happen during the match as the competition increases. This is particularly evident in tennis, as a player struggles to serve out a match, or during a penalty shootout in soccer.
- having more negative thoughts and doubts about their own ability, leading to decreased confidence and self-belief.

All athletes – particularly those who suffer more from trait anxiety – identify factors that lead to increased anxiety, become skilled in recognising the signs and feelings of increased anxiety (both in and out of competition) and develop strategies and techniques to help manage these (which are discussed below).

Figure 2.78 The immense pressure an athlete faces during elite competition can challenge the athlete's mind almost as much as the physical demands of the sport

Sources of stress

Stress is a natural part of human existence, and is closely linked to the pressures associated with the competitive sporting environment. All athletes respond to stressful situations in unique and individual ways, which are associated with their level of trait anxiety. Positive stress caused by exciting circumstances, such as bungy jumping, is called eustress. However, stress caused by undesirable threats is called distress. Excessively elevated levels of cortisol, the hormone released in response to stress, are linked with a range of health conditions such as heart disease. Often people will say that they perform best when there is a small amount of stress, as it compels them to action. An example of this is an upcoming exam, which will motivate a student to study. There are many internal and external sources of stress.

Handling stress is a normal part of everyday life. However, experiencing excessive and long-term stress can have many negative personal and performance effects on an athlete. Because of

Figure 2.77 Athletes must develop skills in recognising and dealing with stress

Figure 2.79 Strategies and techniques can empower an athlete to take more control during high-pressure events

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the nature of the competitive environment and professional sport, athletes must develop skills in recognising and dealing with stress. Internal sources of stress relate to a person's personality. Some people tend to stress and worry more about everyday events, whereas others are more relaxed and calm. Feeling threatened – such as the fear of being dropped from a team – can increase stress. External sources of stress could include threats by coaches about the negative consequences of a poor performance, or losing sponsorship, or not having a contract renewed. The fear of losing and performing in front of large crowds is another source of stress with which athletes must be able to deal. There are many strategies and techniques that an athlete can practise and utilise to help them handle the stress of a situation. These skills empower an athlete to take more control during high-pressure events. These are discussed in the next section.

Optimum arousal

All sports require athletes to be in a certain mental state and condition prior to competing. This differs between sports, and athletes also present with individual differences in their mental state during the final moments prior to competing. Research has found that different tasks require different levels of arousal for optimal performance. For example, difficult or intellectually demanding tasks may require a lower level of arousal (to facilitate concentration), whereas tasks demanding stamina or persistence may be performed better with higher levels of arousal (to increase motivation).

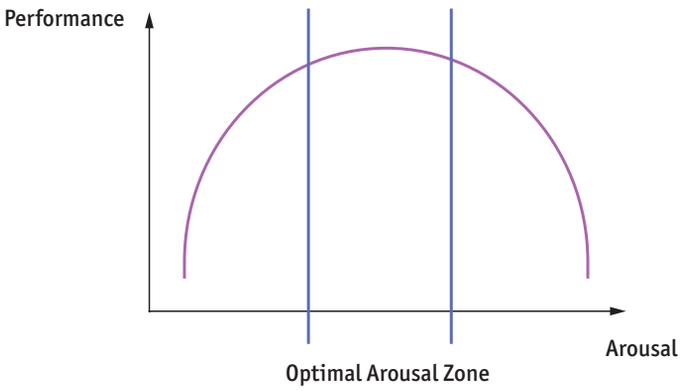

Figure 2.80 Graph demonstrating the optimal arousal zone, based on the inverted U hypothesis

The arousal level of an athlete can play a significant role in determining success. Adequate preparation of the athlete for the impending event involves physically preparing the athlete, as well as achieving this specific level of arousal. This relationship is demonstrated in the theory commonly known as the inverted U hypothesis. Yerkes and Dodson (1908) originally considered the relationship between arousal and performance. The Hebbian version of this suggested a specific point of arousal where performance was optimised. Later developments of the theory in relation to sport suggested that, rather than a precise point of optimum arousal, a broader zone exists that takes into account individual differences and natural fluctuations of this optimal arousal to suit the task ahead. This is demonstrated in Figure 2.80.

When an athlete who is about to compete is suffering from arousal levels that are either too high or too low, they are less likely to be able to reach their full potential. They must be able to assess and adjust their arousal levels both leading up to an event and during the event. Specific psychological skills can be employed at this point to either increase or decrease arousal (discussed in the next section).

Going further 2.24

Inquire

'Prior to the event, the athlete was so pumped up – totally psyched and buzzing around the room – ready to take on and conquer all. They seemed so confident, almost to the point of arrogance.'

1. **What images came to mind when reading this?**
2. **What sport did you associate with it?**
3. **Do all elite athletes have to be in such a state to ensure success?**
4. **If you answered no to the previous question, what is different about the sport that would indicate this?**

Figure 2.81 Boxing demands a high level of arousal

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Figure 2.82 Archery demands a lower level of arousal

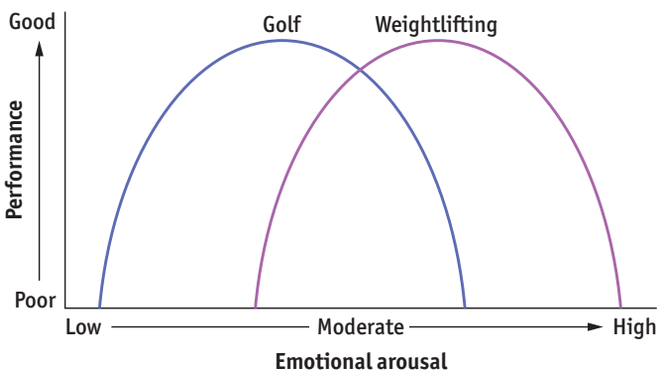

Figure 2.83 Sport-specific optimal levels of arousal

High levels of arousal are suitable for sports that are either very physical or combative in nature, such as Rugby Union, boxing and weightlifting.

Sports that generally demand lower levels of arousal, such as shooting and archery, require greater levels of control and concentration.

It is also recognised that athletes actively learning the basic skills and tactics of a sport require lower levels of arousal. Being over-aroused in this situation can lead to decreased concentration and attention. As the athlete develops towards being elite, they are able to effectively use higher levels of arousal to their advantage. This is described in Figure 2.83.

Psychological strategies to enhance motivation and manage anxiety

The importance of a strong and focused mind in sport is now widely recognised. Many professional coaches and athletes believe that the awareness of one's state of mind, as well as a range of effective strategies to mentally prepare for competition and maintain self-belief, can be the difference between winning and losing. This is most clearly evident in the case when the world's best are in the heat of battle, where the physical characteristics and skill levels are evenly matched. Consider a play-off in golf between the world's number 1 and 2 ranked players at a major tournament such as the US Open, or a penalty shootout at soccer's World Cup.

To ensure athletes are adequately prepared for elite competition, coaches and managers will employ the expertise of a sports psychologist, to develop a close relationship with athletes and to help individual athletes recognise potential problems with their current level of motivation, arousal levels, anxiety and stress, especially while competing. Once these are identified, a range of psychological skills can be developed and practised, to help achieve even greater performances in competition. By helping the athlete enhance their motivation and manage anxiety, they increase the likelihood of improved performance.

Going further 2.25

Inquire

Imagine a coach asking an athlete whether they are 'switched on and ready'. They are essentially asking them whether they are in the right state of mind to rise to the occasion and compete.

1. **Are their arousal levels at the optimum level?**
2. **Imagine the response of a Rugby League player compared with an archer. How would each of these athletes feel if they said 'no'?**
3. **What advice would you give to each athlete to either increase or decrease their arousal level?**

Figure 2.84 An athlete's mental preparation strategy can be the difference between winning and losing

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Summary 2.26

1 What are trait and state anxiety?
2 What are some sources of stress?
3 What is the optimal arousal zone?
4 What are indicators of under-arousal?
5 What are indicators of over-arousal?

Concentration/attention skills (focusing)

The ability to maintain concentration for an extended period of time can be challenging. A range of external and internal factors can distract someone from the task on which they are currently focusing. All physical skills require cognitive processing. This could be to:

- read and filter cues received through the five senses into relevant and irrelevant categories
- read and interpret the movement and tactics of opposing players
- be able to make correct decisions that complement the execution of a particular game plan.

Athletes are able to execute many routine skills automatically, with minimal concentration and specific thought. This is achieved through years of training to practise and refine motor patterns. However, the basketballer who executes a technically correct pass that is intercepted because of a poor read of the opposition's movements has failed to accurately focus on the relevant cues and make a correct decision. Athletes must maintain their concentration and attention on relevant cues, and be able to ignore cues that are largely irrelevant. All sporting scenarios present a unique challenge to the athlete when it comes to maintaining the correct focus.

Generally, athletes have to be able to achieve three things when maintaining their focus:

- select the important and relative cues on which to focus, and ignore the rest
- manage their concentration and attention when their focus is either voluntarily or involuntarily shifted
- focus on a number of relevant cues simultaneously if required.

Checklist 2.27

1 Explain the difference between anxiety and arousal.
2 How does this affect performance?

Going further 2.28

Inquire

Reflect upon your level of concentration right now, in class.

1 Is it adequate to learn?
2 How does it compare with another lesson from today?
3 What are some of the factors that support your concentration and act as barriers to staying focused?
4 How much responsibility do you take for the level of concentration and focus you have in class?
5 How could you increase this to enhance learning?

Generally, successful athletes are able to focus more on the process and actual movement skill or team tactic to be executed, and ignore the factors that do not have a direct impact or relevance to the actual execution. This is particularly important prior to executing skills performed in a more stable and static environment, such as a penalty shot, free throw or conversion. However, in these moments the athletes will be more acutely aware of their thought processes, and are more likely to have to combat thoughts of doubt, fear and anxiety. The athlete must be able to stay positive and confident, focus only on the relevant cues and information, and be able to block and ignore the factors that are irrelevant to the impending skill to be performed.

Another aspect of concentration and attention is the unique situation where an athlete enters a state of total immersion and focus on the play around them. This is a very satisfying experience that is unique to experienced athletes, where the skill execution itself is second nature. While analysing and moving in a very dynamic and competitive environment, they make decisions and execute skills with little conscious thought. This is evident in soccer, when a team makes a number of quick and successive passes through opponents to score.

Going further 2.29

Collaborate

In small groups, identify a range of common sporting scenarios that demonstrate each of these aspects of an athlete's focus.

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Players involved are reading the movements of both opponents and team-mates, and making instantaneous and complex decisions on their next move, then executing them with amazing timing and accuracy.

Mental rehearsal/visualisation/ imagery

Most professional athletes and coaches recognise the value and power of being mentally strong, even in sports that primarily seem to be physically based, such as weightlifting. Being able to control doubt, fear and anxiety while remaining centred and focused can provide the edge required for victory. Both real and fictitious **imagery** created in the mind can help athletes achieve both these goals. Athletes can use their imagination and visual memory to improve performance. Two major types of imagery used are mental rehearsal and **visualisation**.

imagery the internal and visual creation or recollection of images and scenarios

visualisation creating and focusing on a range of positive mental images and experiences, to achieve specific psychological benefits

If practised and properly performed, mental rehearsal is a powerful psychological skill and phenomenon that can be used to a player's advantage, increasing the likelihood of success. It allows the athlete to experience the skill before it has actually occurred. It is most useful for self-paced skills that are under the total control of the athlete. Such sports include golf, archery, long jump, shot put, diving and gymnastics vault. These opportunities also exist within dynamic sports such as a free throw in basketball or a conversion kick in Rugby League.

Athletes should practise this skill in training, to ensure they are able to effectively execute it in the competitive environment. Some key guidelines are:

- The skill should be performed from the athlete's point of view, as in the first person.
- They should always be successful.
- The skill should be visualised in real time, from start to finish.
- Once rehearsed, the athlete should attempt the skill without delay for maximum effect.

Athletes who routinely use mental rehearsal report decreased anxiety and greater confidence. It also assists them to focus on the skill while ignoring distractions such as their own negative thoughts and heckling from the crowd. One of the greatest benefits of mental rehearsal is the effect it has on the neuromuscular system. Elite athletes have highly refined motor patterns, which helps account for their incredible consistency in skill execution. Effective mental rehearsal stimulates this precise motor pattern, without resulting in the actual movement being rehearsed. Athletes report being able to almost 'feel' this sensation throughout their bodies as they prepare to perform.

While also involving role-play and imagining specific mental scenarios, visualisation differs from mental rehearsal primarily through the lack of reality that can exist in the mental image. This depends upon the desired psychological outcome the athlete desires in preparation for competition.

If an athlete were trying to relax, decrease anxiety or arousal levels and trying not to think too much about the impending intensity or stress of competition, they could focus on an image or scenario that calmed them down and allowed them to focus on something unrelated – for example, imagining relaxing on a secluded island in the warm

Going further 2.30

Create

Watch video footage of athletes executing set skills under relatively controlled circumstances, while having to handle intense mental pressure.

1. **What are the relevant cues that demand attention, and what are the irrelevant cues that need to be ignored and blocked from the athlete's immediate attention?**
2. **What strategies are employed to assist these athletes in such circumstances?**
3. **Famous last words: What are the 'top five worst thoughts' a coach wants their athlete to think of prior to taking the final set shot to win the grand final? Replace these with thoughts that complement and enhance the concentration of the athlete.**

Going further 2.31

Communicate

Reflect on and share personal anecdotes where you have experienced this 'Zen'-like state of flow, as you achieved your most memorable feats in sport. These are as common in the playground as they are in the Olympics.

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sun. Anything that promotes feelings of calm and relaxation could be used for this.

However, if the athlete were seeking to increase confidence and arousal levels, a more stimulating visualisation would achieve this – for example, imagining performing incredible feats such as winning gold, scoring a miracle goal or making a 'crunching' tackle would allow an athlete to feel almost invincible. While this may seem to lead to an 'inflated ego', a positive impact can be found in the increased confidence and arousal for intense and combative competition.

A unique feature of visualisation is that it can be used while actually performing or training to increase the intensity of effort. An athlete running on a treadmill could imagine that they are running in front of their home spectators in an Olympic Games final. By creating a scenario and role-playing it to ensure incredible success, the athlete can push their body to greater heights as they ignore feelings of pain and fatigue. Some key guidelines for visualisation include:

- It should be practised and rehearsed away from actual competition, prior to using it before or during competition.
- Most images should be from the perspective of a spectator – that is, in the third person.
- Success should always be evident in sporting visualisations.

Athletes should become aware of the specific physiological impact of certain visualisation techniques, and ensure that they do not over-compensate for the desired effect. For example, relaxing too much could lead to feelings of tiredness or lack of focus, whereas an athlete may become over-aroused, leading to decreased performance. Athletes need to be aware of anxiety levels, emotional levels, heart and breathing rates as well as feelings of nerves, sweating, or tiredness and lethargy.

Relaxation techniques

The ongoing and intense stress of elite competition can lead to decreased performance, burn-out and the loss of desire to compete. It could possibly even contribute to the development of a mental health condition, such as depression, if left unchecked. Specific relaxation techniques play a major role both in and away from the competitive environment. Generally, methods of relaxation are used while the athlete is sensing increased feelings of stress, anxiety and arousal prior to or during competition.

The use of calming and relaxing music can take the athlete's mental attention away from distracting and negative thoughts that could be flooding their mind. It can also help them to zone away from outside distractions and noise, allowing them to focus their thoughts on the upcoming performance. The chosen music should lead to feelings of relaxation and focus. If music is used while an athlete is training, such as on a long training ride, the athlete should not develop an over-reliance on this mental distraction, as it is most likely not permitted during actual competition, where the athlete will not be able to use music to distract them from feelings of fatigue.

The conscious use of controlled and rhythmic breathing is an effective way of calming an anxious athlete, especially if they are physically reacting to high levels of state anxiety. It can provide a single point of focus and concentration. An athlete could be mindful of the feelings of the cool air rushing in and warm air being exhaled through the nose and mouth. When coupled with visualisation, the athlete is able to directly affect their levels of anxiety and arousal. Some athletes may even use a specific aromatic smell, such as the menthol in a warm muscle rub, to increase arousal and alertness, by stimulating the limbic system of the brain. Alternatively, smelling certain essential elements such as lavender can help calm and relax an athlete.

Meditation based on Oriental practices such as yoga and tai chi, or more sensory-based meditations focused on the feelings of warmth and heaviness of the body, can help athletes relax and escape from the stressors of training and competition. These can be done privately be listening to a podcast or in a group led by a trained instructor. These are often accompanied by music and aromatherapy, and some athletes describe these sessions as essential for helping them maintain good mental health and well-being.

Going further 2.32

Collaborate

Students need to be divided into three groups:

- **practical practice-only group**
- **mental rehearsal-only group**
- **combined practical and mental rehearsal group.**

Students are to spend a set amount of time engaged in practice of a common sporting skill using their given practice method. Discuss the experiences of each group following five executions of the skill following the practice period.

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A popular method of relaxing both the mind and body is Jacobson's progressive muscle relaxation technique (PMR), first devised in the 1920s. This is a proven method to decrease an athlete's perceived levels of anxiety, and has even been reported to help decrease the effects of certain physical ailments. Biofeedback research demonstrates the positive effect of PMR in decreasing heart and ventilation rate, as well as brain activity and stress. Similar to meditation, it helps provide a narrow focus point, concentrating on feelings of relaxation. In a quiet environment, the athlete closes their eyes and follows a two-step process:

1 Increase the tension of a specific muscle by performing a gentle isometric contraction.
2 After a few seconds, release the tension and contraction and focus on the feeling of relaxation in the muscle.

This is repeated throughout the body on different muscles. PMR can be performed both in and outside of competition.

Goal-setting

goal-setting the process of establishing achievable and realistic goals, to increase motivation and provide direction to an athlete's behaviour

Elite athletes are highly driven individuals, who aim to be the absolute best that they can be. The commitment and efforts made during training to fully prepare themselves for competition are arduous and highly taxing, both physically and mentally. Only the most dedicated and self-disciplined of athletes generally go on to achieve greatness.

Consider the following example of a typical training day for an ultra-triathlete:

- Wake up at 4.30 am every morning.
- Each Monday, Wednesday and Friday, swim from 5 am until 7 am.
- On Tuesdays, Thursdays and Saturdays, bike ride instead.
- Each week, swim around 30 kilometres, ride about 800 kilometres and run about 120 kilometres.
- Have a midday sleep before going for an hour's run in the afternoon.
- Go to sleep by 9.30 pm.

An athlete's drive, motivation and enthusiasm for training naturally vary; however, it is evident that such training requires the strictest self-discipline and commitment. To assist with this, effective goal-setting can be invaluable in helping athletes stick to strict training regimes and continue to produce the physical efforts required to achieve success and improved performances. Goals are important to help keep athletes accountable to a previously established expectation or standard, and the athlete may have several goals in place at any one time in relation to a range of lifestyle, training and performance factors. These could include the following:

- **nutritional goal** – adhering to a set nutritional plan as established by a dietician
- **lifestyle goal** – avoiding alcohol or ensuring that the athlete is asleep by a set time on most nights
- **training goal** – completing a set volume of training in a set time, such as 40 kilometres of swimming per week
- **performance goal** – winning gold or finishing the season in the top four.

Going further 2.33

Inquire

1 What is the difference between attitude and behaviour? Which factor drives the other? How could athletes use this to their advantage? How could a student use this to their advantage? How does a person change their attitude?
2 Reflect on the current goals you have in your life.
   - If you do have a current goal established, what influence does it have on your behaviours and attitude?
   - If you don't have any identifiable goals, to what extent do you think this could be influencing your current attitude and behaviours?
3 Discuss these reflections and consider the role of goal-setting in helping to guide attitudes and behaviours.

Going further 2.34

Communicate

Interview or invite a former or current elite athlete as a guest speaker, to discuss the strategies they use to enhance their motivation and manage anxiety. Students should establish set questions based on the PDHPE syllabus, to identify specific examples of these psychological principles in action.

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Going further 2.35

Collaborate

Play a small game where the students are competing under pressure. Strategies to increase the pressure could be to add an incentive to winning, such as having lunch bought for them, or a disincentive such as the loser having to carry their bag for the rest of the day. The activity should be fair and stable, such as a set free throw in basketball. Students should then reflect on their level, types and sources of motivation, the anxiety they perceived as the game progressed and the psychological skills they employed to manage this. Students should debrief this in small groups with another student acting as an interviewer of each athlete, comparing their responses.

A number of people should be aware of an athlete's particular goals, such as their sports psychologist, coach and family. This increases the accountability and likelihood of success. Also, goals should be kept visible, to act as a constant reminder of the intended aim. For example, a poster on a wall, an image as a screen-saver on a phone or writing something on a piece of tape wrapped around the wrist can all serve as such reminders.

A common acronym to help establish effective goals is to use the principles of SMARTER:

- Is the goal **specific**? Goals should be explicit and clearly defined. There should be no doubt about the standard that the athlete is aiming to achieve. An athlete who says 'I aim to do well' is not establishing a definitive level of performance or achievement.
- Is the goal **measurable**? Generally, goals that are quantifiable (able to be measured in numbers) are more effective in setting a clear expectation of success – for example, decreasing an athlete's personal best in the 400-metre sprint to below 45 seconds or their weight to 85 kilograms. Performance-based goals are not always able to be expressed using statistics; however, honest reflections from either the athlete or an educated observer such as a coach can still track progress and improvement.
- Is there an **action** plan to help achieve the goal? Athletes generally set longer-term goals (anywhere from three months to four years in the case of the Olympics). It is hard to connect such distant goals to the short-term demands of today's arduous training program. Therefore, a range of related short-term and mid-term goals need to be identified and established that will help track the athlete towards their ultimate long-term goal. Often these goals are more training and behaviour based, as the long-term goal is likely to be performance based, such as winning the grand final. Short-term goals could include:
  - increasing training intensity by decreasing a weekly 5-kilometre test run by 15 seconds per week
  - for this week's Rugby League game, aiming for a completion rate of 75 per cent
  - sticking to an established nutritional plan
  - sleeping at least eight hours per night.
- Is the goal **realistic**? Goals need to be something for which to strive. If the set goal is too easily achieved, then the athlete is not driven to work harder and push themselves. However, goals can be too hard and somewhat unlikely to be achieved because they are outside the athlete's current level of potential achievement or improvement. When setting a performance goal, athletes must be honest with their current level of development and the level that they could see themselves achieving in a set time. Goals that find this delicate balance between being too easy or difficult to achieve are most effective in helping the athlete reach their potential without disheartening them.
- What is the **timeframe** of the goal? All goals, whether they are short term (days to weeks), mid-term (weeks to months) or long term (months to years), should have a defined timeframe within which the athlete intends to achieve the goal. This imposes finality on the athlete, and will increase the chances of success.
- Goals should be routinely **evaluated** using a suitable tool or test. This could be a questionnaire, training log or statistical data

Summary 2.36

1. What are focusing skills?
2. Distinguish between mental rehearsal, visualisation and imagery.
3. Outline a range of relaxation techniques.
4. Set yourself a short-term and a long-term goal.

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Checklist 2.37

Research the case study of a particular athlete. What do they use as motivation? What psychological strategies do they employ?

from a GPS device. This process should occur at regular intervals throughout the timeframe (such as fortnightly), and should involve the athlete and a coach or trainer who can provide independent assessment. This can allow progressive modifications to the goal to be made if the athlete is either tracking below or above the expected progress level. This ensures the goal stays realistic and achievable.

- When establishing a goal, the athlete should identify potential or set **rewards** that will be realised if the goal is achieved. These could be the inherent effect of a particular goal, such as personal glory and satisfaction, prizemoney or achieving a number one ranking. However, it could be a personal reward put in place by the athlete, coach or even their family for a particular goal that may not relate to a competitive performance outcome. This could be a holiday, contract extension or monetary reward for a specific achievement. Extrinsic and material rewards are less effective. Athletes being driven by internal factors generally show more resilience, perseverance and commitment.

At this point, athletes must be very aware of their self-talk (the internal self-conversation and thoughts). This can lead to further anxiety if uncontrolled and unhelpful, whereas positive self-talk can be beneficial in helping to control feelings of anxiety and increasing motivation.

Going further 2.38

Create

Students should establish and set an actual goal for themselves to achieve. This could relate to a set standard of academic achievement, a fitness or sporting goal, or even a goal to save a set amount of money. Ensure that the goal reflects the principles of SMARTER, and has a very clear action plan set to help achieve the goal.

The goal should then be signed by someone else (such as a parent, friend or teacher) as a means of accountability; this person should also be given a copy of the goal. In addition, a visual reminder of the goal itself should be put somewhere to act as a reminder.

Regularly review progress and make necessary adjustments. Once established, students should reflect on what it feels like to specify a desired goal, and how they think this may influence their attitude and behaviours.

Figure 2.85 Goal-setting can be an invaluable tool to help keep athletes accountable

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2.3 The effects of nutrition and recovery strategies on performance

Nutritional considerations

Driving questions 2.39

1 What specific changes do you make to your dietary intake to account for increased physical activity?
2 What are the specific reasons for each of these changes?
3 If an elite athlete were to regularly neglect their diet, in what ways would this be detrimental to their performance?

Pre-performance

The training diet

The aim of the training diet is to achieve nutritional adequacy (providing the body with recommended intake of vitamins and minerals) and provide appropriate amounts of energy to support training and body composition goals. It is important that nutritional targets for athletes (such as total energy, protein and carbohydrate requirements) are based on an individual athlete's goal body weight and muscle mass, as this provides more specific targets.

Carbohydrates (starches and sugars) are a key fuel source for exercise, especially during

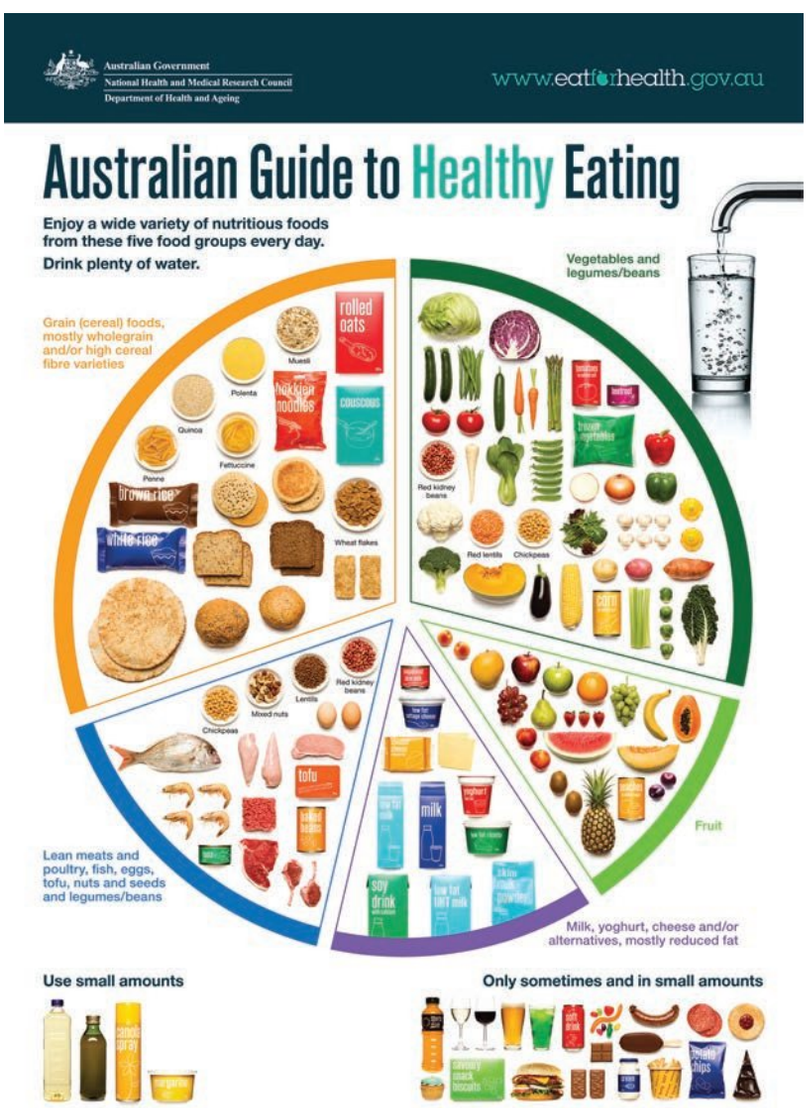

Figure 2.86 Australian Guide to Healthy Eating

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Figure 2.87 Carbohydrates are a key fuel source for exercise

prolonged and high-intensity exercise. The body stores carbohydrate as glycogen in the skeletal muscles and liver; however, its storage capacity is limited. If athletes are not able to consistently provide adequate energy and carbohydrates in their training diet, this can lead to fatigue, inability to improve in training, poor concentration during training sessions, reduced immune system functioning and increased susceptibility to injury.

The amount of carbohydrate needed depends on the fuel needs of the athlete's training program, including the frequency, duration and intensity of the training. Training sessions and activity levels change from day to day, and carbohydrate intake needs to be adjusted to reflect this. On high-activity days, carbohydrate intake should be increased to provide the required fuel for the extra activity and promote recovery between sessions. Alternatively, on low- or no-training days, carbohydrate intake should be reduced to reflect the decreased training load.

	Situation	Carbohydrate targets
Light	Low-intensity or skill-based activities	3–5 g per kg BM
Moderate	Moderate exercise programme (~1 hour/day)	5–7 g per kg BM
High	Endurance program (i.e. moderate- to high-intensity exercise of 1–3 hours/day)	6–10 g per kg BM
Very high	Extreme commitment (i.e. moderate- to high-intensity exercise of >4–5 hours/day)	8–12 g per kg BM

BM = body mass

Table 2.10 Daily needs for fuel and recovery

The pre-event meal

The aim of the pre-event meal is to ensure the athlete's glycogen stores are topped up and they are well hydrated. Establishing a good pre-event meal, which provides the right nutrients and fluids, provides psychological benefits for athletes as they know they have prepared well. This meal should be high in carbohydrates, moderate in protein and low in fibre and fats. Meals high in fibre and fat take longer to digest, and therefore can lead to stomach discomfort during exercise.

Key considerations for the pre-event meal include:

- What is the duration and intensity of the event?
- How long has it been since the last meal or snack?
- How long is it until the event starts?

The following foods are suitable to eat three to four hours before exercise:

- crumpets with jam or honey + flavoured milk
- Pancakes with honey or maple syrup
- baked potato + cottage cheese filling + glass of milk
- baked beans on toast
- breakfast cereal with milk
- bread roll with cheese/meat filling + banana
- fruit salad with fruit-flavoured yoghurt
- pasta or rice with a sauce based on low-fat ingredients (e.g. tomato, vegetables, lean meat).

The following snacks are suitable to eat one to two hours before exercise:

- liquid meal supplement
- milkshake or fruit smoothie
- sports bars (check labels for carbohydrate and protein content)
- low-fibre breakfast cereal (rice bubbles/ cornflakes) with milk
- cereal bars
- fruit-flavoured yoghurt
- fruit.

Source: Adapted from AIS, 'Eating before exercise fact sheet' (see www.cambridge.edu.au/hscpdhpe1weblinks).

Some of the glycogen stores in the liver are released overnight to provide glucose for the brain, as the brain remains quite active during sleep. Athletes who compete in events that have early morning starts (such as some triathlons or endurance events) need to be aware of this, and develop a nutritional plan such as getting up extra early to ensure they have time for an adequate breakfast or planning a high-carbohydrate snack within one to two hours of the event starting time. This enables them to top up the glycogen losses in the liver that occur during an overnight fast.

Hydration before the event needs to be planned carefully, and should start many hours

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before the event commences. As a guide, athletes should include 300–600 millilitres of fluid with the pre-event meal and another 300–400 millilitres approximately 20 minutes before the event, allowing enough time for a toilet stop if needed. Fluids should also be sipped regularly between the pre-event meal and the starting time, and using fluids that contain sodium will help fluid absorption. It is important for athletes to keep a drink bottle with them to help prompt them to consume enough fluid, as many athletes forget to hydrate well due to nerves, organising equipment or going over tactics/race strategy with coaches.

Carbohydrate loading

Carbohydrate loading refers to strategies that aim to maximise muscle glycogen stores prior to a competitive event (high carbohydrate intake combined with light training or rest). For events lasting for less than 60 minutes, there is no performance benefit associated with carbohydrate loading, and it may actually have a negative effect on performance in short-duration events at high intensity. Provided the athlete has only engaged in light exercise or rested for the 24–36 hours prior to the event, adequate glycogen stores will be achieved with an intake of around 5 grams of carbohydrate per kilogram of body weight over this period.

Figure 2.88 Carbohydrate loading can improve performance in endurance events such as triathlons

For endurance events lasting more than 90 minutes, such as marathons, triathlons, long-distance swimming, cross-country skiing and road race cycling, effective carbohydrate loading can improve overall performance by 2–3 per cent.

Traditional carbohydrate loading protocols consisted of a three- to four-day 'depletion phase' involving hard training and a low-carbohydrate diet, followed by a three- to four-day 'loading phase', which involved tapered training and a high-carbohydrate diet. More recent studies have shown that glycogen stores can be increased to the same levels by following a high-carbohydrate diet for 36–48 hours while the athlete is rested. The recommended carbohydrate intake to achieve effective carbohydrate loading is 8–12 grams per kilogram of body weight.

Breakfast	3 cups of low-fibre breakfast cereal with 1.5 cups of reduced fat milk 1 medium banana 250 mL orange juice
Snack	Toasted muffin with honey 500 mL sports drink
Lunch	2 sandwiches (4 slices of bread) with filling as desired 200 g tub of low-fat fruit yoghurt 375 mL can of soft drink
Snack	Banana smoothie made with low-fat milk, banana and honey Cereal bar
Dinner	1 cup of pasta sauce with 2 cups of cooked pasta 3 slices of garlic bread 2 glasses of cordial
Late snack	toasted muffin and jam 500 mL sports drink

Table 2.11 Example of a carbohydrate loading meal plan based on a 70 kg athlete

Source: Adapted from AIS, 'Carbohydrate loading fact sheet' (see www.cambridge.edu.au/hscpdhpe1weblinks).

This sample plan provides about 14 800 kJ, 630 g carbohydrate (9 g/kg body weight), 125 g protein and 60 g fat.

If athletes have followed an effective carbohydrate loading plan, they typically experience weight gain (usually about 1 kilogram). This is due to the increased glycogen in the muscle and also extra water, which is stored with the

glycogen. Athletes need to be informed that this weight gain is a sign that they have effectively increased their glycogen stores and is not an increase in body fat. The fear of weight gain may prevent some athletes from carbohydrate loading.

During performance

The most important factor when considering whether carbohydrate intake during exercise will improve performance is the duration of the exercise. The following table summarises the amount of carbohydrate recommended during exercise.

	Duration	Carbohydrate targets
During brief exercise	<45 min	Not required
During sustained high-intensity exercise	45–75 min	Small amounts including mouth rinse of carbohydrate drink
During endurance exercise including 'stop and start' sports	1–2.5 hours	30–60g/hr
During ultra-endurance exercise	>2.5–3 hours	Up to 90 g/hr using multiple types of carbohydrates
Speedy refuelling	<8 hour recovery between two fuel-demanding sessions	1–1.2 g/kg body weight every hour for first 4 hours then resume daily fuel needs

Table 2.12 Carbohydrate recommendations during exercise

Source: AIS, 'Carbohydrate – the facts' (see www.cambridge.edu.au/hscpdhpe1weblinks).

It is important that athletes plan their food and fluid intake carefully to meet these carbohydrate targets during exercise. In endurance events, where a consistent carbohydrate intake is needed over many hours, it is important to think about the type of carbohydrate the athlete is going to consume. Repeatedly having the same type of sugars from sports drinks or energy gels can cause athletes to experience symptoms such as stomach cramps, bloating, the need to go to the toilet and potentially diarrhoea. A combination of 'sports foods' (such as gels and sports drinks) and real foods (fruit, muesli/sports bars, low-fibre sandwiches) is best tolerated. Another benefit of using a mix of sports foods and real foods is that the foods the athlete eats during the event can also be a good source of key electrolytes such as sodium, potassium and magnesium to help with hydration.

It is important that athletes carefully plan their food and fluid intake according to the event, and identify where their opportunities to eat and drink will occur. Consider a triathlon, for example. There is no opportunity for athletes to carry or consume food during the swim leg. There is also a better opportunity for athletes to carry more food and eat on the bike than during the run leg.

Fluid

It is important that athletes are educated about hydration, and that any fluids provided to athletes are cool, palatable and conveniently available, or they will not be consumed. Research has shown that athletes typically only replace 30–70 per cent of sweat lost during exercise.

Fluid requirements vary significantly between athletes and between exercise situations. Fluid losses are affected by:

- genetics – some people sweat more than others
- body size – larger athletes tend to sweat more than smaller athletes
- fitness – fitter people sweat earlier in exercise and in larger volumes
- environment – sweat losses are higher in hot, humid conditions
- exercise intensity – sweat losses increase as exercise intensity increases.

When planning for an endurance event, athletes should carefully monitor their fluid intake during training and try to simulate race conditions (intensity, duration and environmental conditions) where possible. Negative effects on performance start to occur at just 2 per cent dehydration, so athletes should aim to keep their fluid losses to less than this. The potential effects of mild dehydration include:

- reduced mental function leading to poor concentration
- increased ratings of perceived exertion leading to feelings of fatigue at lower intensity
- delayed gastric emptying from the stomach leading to stomach discomfort
- poor aerobic performance
- impaired heat regulation.

By recording body weight immediately before and after exercise (with minimal clothing, if any) athletes will get a reasonably accurate idea of their fluid losses as 1 kilogram loss in weight reflects approximately 1 litre fluid loss.

For example, if an athlete weighs 70 kilograms before exercise and 68 kilograms after, the 2 kilogram loss of weight reflects their overall fluid losses over that exercise session (a 2.9 per cent

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loss). It is also important to record any fluid the athlete has consumed over that session in order to calculate the overall sweat rate and develop a hydration plan according to this.

Over-hydrating

Consuming fluid in excess of requirements may cause some gastrointestinal discomfort, and can lead to hyponatraemia (low blood sodium levels), which causes symptoms similar to dehydration and is potentially life threatening. Hyponatraemia is unlikely to occur in events of less than two or three hours' duration, and athletes are at risk when large volumes of low-sodium drinks (such as water) are consumed when sweat losses are small. Those most susceptible to hyponatraemia are small females who have long race times (more than three or four hours), as these athletes tend to have relatively small sweat losses and plenty of time to consume large amounts of fluid during the event. As a result, structured hydration plans are often not advisable for these athletes. The best way to prevent hyponatraemia is to focus on consuming sodium-containing fluids such as sports drink and sodium-containing foods such as vegemite sandwiches, as well as limiting fluid intake to no more than sweat loss.

It is very important that athletes train their diets to make sure the foods and drinks they plan to have during the event are well tolerated and don't result in any stomach upset, as this can significantly affect performance and may result in the athlete not even finishing the race. The general advice is not to try anything new on event day.

Post-performance

Recovery nutrition has received much attention, and has been heavily researched in recent decades. Immediately following exercise, the activity of enzymes involved in refuelling (synthesis and storing glycogen) and repairing (repair of damaged muscle tissue and building of new muscle tissue) is increased significantly. Therefore, the aim of the recovery meal/snack is to provide carbohydrate to refuel and protein to repair muscle tissue as well as fluid to correct any dehydration.

Athletes are encouraged to consume foods and drinks that provide 1–1.2 grams of carbohydrate per kilogram of body weight within the first hour of finishing, as this is when rates of glycogen synthesis are greatest. This is especially important if the time between prolonged training sessions is less than eight hours. High glycaemic index carbohydrate foods have been shown to refuel muscle and liver glycogen stores more quickly, and these should be the basis of the carbohydrate consumed within the first hour. This meal should also be low in fibre, as this will slow the digestion and absorption of carbohydrate. Conveniently, the majority of high glycaemic carbohydrates are low in fibre.

Search for the glycaemic index of different carbohydrates on the University of Sydney website (see www.cambridge.edu.au/hscpdhpe1weblinks).

A small amount of protein is also important for muscle recovery, especially after high-intensity sports and strength training. Athletes should aim to have approximately 15 grams of protein following high-intensity exercise, and recent research suggests that the optimal amount following strength training and power-based sports is about 300 milligrams of protein per kilogram of ideal body weight (21 grams of protein based on a 70 kilogram athlete).

Examples of low-fibre recovery meals that provide carbohydrate and protein include:

- milkshakes/smoothies
- liquid meal supplements based on milk
- yoghurt and fruit salad
- crumpets/muffins/toast with jam or honey with 300 millilitres of milk
- bowl of low fibre cereal with milk.

After high-intensity exercise, the immune system can be suppressed for many hours. Consuming a suitable recovery meal has been shown to improve the functioning of the immune system, which is important to help prevent athletes catching infectious illnesses.

Do athletes need a post-performance meal?

Athletes need to think practically about their day-to-day training schedules and plan recovery meals accordingly. If athletes have only completed a short training session or trained at a low intensity, then it is highly unlikely that they have completely used their glycogen stores and therefore do not require such a high-carbohydrate recovery meal. If athletes routinely consume more carbohydrate than they need, it may lead to unwanted weight gain, which will hamper performance.

Dietary requirements of athletes in different sports

Different sporting events vary significantly in their intensity and duration, and so do athletes' nutritional needs in different sports. To highlight the extent of the different fuel needs of different sports, compare cyclists competing in the Tour de France with athletes in low-intensity and short-duration sports such as archery. The energy needs of cyclists in the Tour de France can be as high as 30 000 kilojoules a day on the longer-duration and higher-intensity stages, and average 20 000–25 000

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Going further 2.40

Inquire

Consider the sports in Table 2.13 and tick or cross the boxes appropriate for each sport.

Sport	Do they need a high-carbohydrate pre-event meal?	Will carbohydrate during the event improve performance?	Do they need a specific recovery meal after performance?
Elite ironman triathlon (9–10 hours' duration)			
Midfield player in soccer match (90 minutes' duration)			
Sprinter (100 metre and only one race in a day)			
A competitive surfer in a 35-minute heat (only surfing one heat that day)			
Elite rower (competing in two heats and a final in one day)			

Table 2.13 Dietary requirements

1 **Explain why you have ticked the boxes you have.**
2 **What sorts of foods and drinks would you use for each of the boxes you have selected for the different sports? (Make sure you consider the opportunities the athlete has to eat and drink during each event.)**

Figure 2.89 The energy needs of cyclists in the Tour de France vary greatly from athletes competing in a sport such as archery

kilojoules a day over the 21-day event. An archer will not require significantly more energy (or carbohydrate) than their typical daily intake of 8000–10 000 kilojoules (depending on gender and normal weight).

Summary 2.41

1 What is carbohydrate loading?
2 Outline the pre-performance nutritional needs of athletes.
3 Outline the nutritional and hydration needs of athletes while competing.
4 Outline the post-performance nutritional needs of athletes.

Checklist 2.42

Compare the dietary requirements of a power athlete and an endurance athlete.

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Supplementation

Vitamins/minerals

Vitamins are a group of micronutrients that are only required in small amounts, and do not provide any energy in the form of kilojoules or calories. Although vitamins don't directly provide any energy, many vitamins play essential roles in the breakdown and metabolism of macronutrients (fats, carbohydrates, protein and alcohol) to produce energy. As well as their involvement in energy-production pathways, vitamins also play a key role in the building and repair of tissue and immune function.

The majority of vitamins are essential, as they are unable to be synthesised by the body, and therefore must be provided through a balanced diet. There are two groups of vitamins: fat-soluble vitamins (vitamins A, D, E and K) and water-soluble vitamins (all B vitamins and vitamin C).

Minerals are also essential micronutrients for optimal health and sports performance. Like vitamins, minerals do not provide energy. Key minerals include calcium, iron, magnesium, sodium, potassium, zinc, iodine and selenium. Iron and calcium are two key minerals that are often deficient among certain athlete groups.

Calcium is integral for bone structure, and also plays a role in muscle contraction. The development of strong bones occurs during childhood and adolescence. An adequate calcium intake, vitamin D status and regular weight-bearing exercise all contribute to the development of healthy bones. If these factors are not accounted for, the risk of fractures, osteopenia and osteoporosis is significantly increased in later life. The quality (density) of bone tissue gradually declines from the mid-twenties in both males and females, and even greater losses occur after menopause in females. Recent national surveys in Australia have identified that calcium intakes of children and adolescents are well below the recommended dietary intake (RDI) levels. Among this age group, there are also decreasing rates of physical activity; combined with a low calcium intake, this is a key risk factor for poor bone health later in life.

Figure 2.90 Dairy products are a good source of calcium

Calcium-rich foods include dairy products, green, leafy vegetables and fish with edible bones such as sardines and canned salmon.

Iron is a key component of haemoglobin, which is responsible for the transport of oxygen around the body. As well as having a significant impact on general health, low iron will negatively affect sports performance due to reduced oxygen delivery to working muscle. As a result, the muscle cells are unable to produce energy and eliminate acidic by-products effectively. Those most at risk of iron deficiency are females, vegetarians and endurance athletes (they have higher sweat losses). Athletes competing in low-weight category events (such as lightweight boxing and rowing), or events where having a low body weight is an advantage, are also at risk due to restricted food intake among these athletes.

Foods high in iron include lean meats, green leafy vegetables, legumes, wholegrain products and fortified products such as breakfast cereals.

Figure 2.91 Lean meats, green leafy vegetables and legumes are good sources of iron

Sports anaemia is a condition experienced by many athletes – particularly during periods of heavy training – and presents as general lethargy and fatigue. This condition is not a true iron deficiency, as it is typically not the result of low iron intake but rather due to significant increases in training load and training adaptations such as increased blood volume. Provided there is an adequate dietary iron intake, sports anaemia will generally resolve with the gradual tapering of the training load.

Vitamin and mineral supplementation

Many athletes choose to supplement their diet with additional vitamins and minerals on top of their dietary intake, believing it will aid performance and recovery. Despite their widespread use, there

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is no clear evidence that general multivitamin supplements improve performance, and the absorption of these vitamins and minerals from a supplement is generally much lower than from eating the foods that contain them. Some research has indicated that these supplements may even prevent the development of certain training adaptations, and therefore may have a negative effect on performance.

Recent research indicates that certain nutrients may improve performance – for example, specific nutrients in beetroot may improve performance in sprint cycling events and power-based sports and magnesium may aid muscle recovery; however, more research is needed to confirm this and identify what the optimal dosage is to achieve these benefits.

Figure 2.92 Many athletes choose to supplement their diets with additional vitamins and minerals

Protein

Protein is important for the building and repair of new tissue, and as a result many athletes competing in strength and power sports take additional protein supplements as they believe it will help increase their muscle mass. Proteins are made up of a range of different amino acids, and a range of different supplements are available in liquid or powder form. It is important that athletes are educated about protein, as it is not used to fuel exercise performance (this only occurs under extreme conditions when carbohydrate and fat stores are exhausted). As protein is not a fuel, the majority of athletes easily meet their protein requirements through their food intake without needing additional supplements. Despite this, many athletes still consume excess amounts of protein, and intakes of around 3 grams per kilogram of body weight are not uncommon among certain athlete groups – especially in male team sport environments. Historically, there has been concern that high-protein diets may have a negative effect on kidney function; however, there is no widespread evidence among healthy athletes to support this.

Figure 2.93 Protein is an important component of an athlete's diet, but many athletes consume excess amounts

An important consideration regarding an athlete's protein intake is how they spread it out over the day. Recent studies have shown that strength gains, muscle hypertrophy and recovery are improved with small amounts of protein (15–25 grams) consumed regularly throughout the day. Many athletes do not evenly distribute their protein intakes, and typically have small amounts at breakfast and snacks and large amounts at the evening meal. Protein supplements/shakes can be attractive to athletes as they are portable and convenient to consume in between meals and after training sessions. The recommended serving size on many of the protein powders available may be as high as 50–60 grams of protein per serving, which is significantly more than required.

Caffeine

Caffeine is a substance found naturally in the leaves, beans and fruits of a variety of plants, and is regularly consumed by some 90 per cent of adults. The most common dietary source of caffeine is coffee, but cola drinks, energy drinks and specialised sports foods and supplements also contribute to regular intake.

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Figure 2.94 Caffeine affects the central nervous system and can optimise performance particularly in endurance sports

Caffeine is rapidly absorbed and transported to all body tissues and organs, where it has a large variety of effects. These may vary between individuals, and can be both positive and negative responses, including the mobilisation of fats to the muscle cells, changes to muscle contractility, alterations to the central nervous system to change perceptions of effort or fatigue, stimulation of the release and activity of adrenaline, and effects on cardiac muscle.

The major benefits of caffeine on exercise capacity and performance appear to be achieved by central nervous system effects. These effects reduce the perception of fatigue and allow for optimal pacing and performance to be maintained for a longer period. This is most likely to benefit endurance sports such as long-distance running, cycling, triathlons and cross-country skiing.

In the past, caffeine has not been recommended among athletes due to its potential to act as a diuretic and contribute to dehydration. More recent studies have shown that small to moderate doses of caffeine have minor effects on overall hydration in people who are regular caffeine users. In addition, caffeine-containing drinks such as tea, coffee and cola drinks provide a significant source of fluid in the everyday diets of many people, including athletes.

Sports supplements and 'pre-workout' supplements are not required to list their caffeine content on the label. For example, several of the supplements in Table 2.16 (page 134) have not listed their caffeine content; however, caffeine (methylxanthine) or guarana – which contains caffeine – are listed as ingredients.

Supplements are not subject to the same criteria as foods, and therefore they may contain significantly more caffeine per serve than common foods and drinks. This is a concern, as many of the 'pre-workout' supplements are popular among young athletes who may not be habitual caffeine users.

These sources also show that there are a variety of protocols of caffeine intake that can enhance performance. These include the consumption of caffeine:

- before the exercise bout
- spread throughout exercise
- taken late in long-duration exercise as fatigue is beginning to occur.

Different protocols may achieve optimal performance outcomes, even in the same sport or individual. Suitable or optimal protocols may be dictated by the specific characteristics of the event, the practical considerations of consuming a caffeine-containing product and the individual characteristics/preferences of the athlete. The athlete who is intending to use caffeine to enhance

Product	Serve	Caffeine content (mg)
Powerade Fuel+ sports drink	300 mL can	96
PowerBar caffeinated sports gel	40 g sachet	25
PowerBar double caffeinated sports gel	40 g sachet	50
PowerBar caffeinated gel blasts	60 g pouch (~9 lollies)	75
Gu caffeinated sports gel	32 g sachet	20–40
Carboshotz caffeinated sports gel	50 g sachet	80
PB speed sports gels	35 g sachet	40
PowerBar Performance bar with Acticaf	65 g bar	50

Table 2.14 Caffeine content of common sports foods and supplements (Australia)

ISBN 978-1-107-43512-4

Food or drink	Serve#	Caffeine content (mg) average and range
Instant coffee	250 mL cup	60 (12–169)
Brewed coffee	250 mL cup	80 (40–110)
Brewed coffee (same outlet on different days)	250 mL cup	130–282
Short black coffee/espresso from variety of outlets	1 standard serve	107 (25–214)
Starbucks Breakfast Blend brewed coffee	600 mL (Venti size)	415 (300–564)
Iced coffee – commercial brands	500 mL bottle	30–200 depending on brand
Frappuccino	375 mL cup	90
Tea	250 mL cup	27 (9–51)
Black tea	250 mL cup	25–110
Green tea	250 mL cup	30–50
Iced tea	600 mL bottle	20–40
Hot chocolate	250 mL cup	5–10
Chocolate – milk	60 g	5–15
Chocolate – dark	60 g	10–50
Viking chocolate bar	60 g	58
Coca-Cola	375 mL can/600 mL bottle	36/58
Diet Coke	375 mL can/600 mL bottle	48/77
Pepsi	375 mL can/600 mL bottle	40/64
Red Bull energy drink	250 mL /330 mL/500 mL can	80/106/160
V energy drink	250 mL/350 mL/500 mL can	78/109/155
Mother energy drink	150/300 mL/500 mL can	48/96/160
Monster energy drink	340 mL/500 mL can	109/160
Lipovitan energy drink	250 mL can	50
Rockstar	500 mL can	160
Vitamin water – energy	500 mL bottle	82
No Doz (Australia)	1 tablet	100

Table 2.15 Caffeine content of common foods, drinks and therapeutic products (Australia)

Source: Adapted from Burke et al, *Caffeine for Sports Performance*, 2013.

Product	Serve	Caffeine content (mg)
Musashi Re-activate Hard Core	15 g powder serve	120
Body Science (BSc) K-OS	13 g powder	150
Jack 3D	5 g powder	? [ingredients: 'caffeine']
No-Xplode	18 g	? [ingredients: 'methylxanthine (caffeine)']
Assault	20 g	? [ingredients: 'caffeine']
1 MR	8 g	300
No-Shotgun	22 g	? [ingredients: 'caffeine']
Amped NOS	40 g	? [ingredients: 'caffeine']
Animal Rage	1 stick	? (ingredients note caffeine/coffee bean extract)
Code Red	10 g powder	? [ingredients: 'caffeine']

Table 2.16 Pre-workout supplements

Source: Adapted from Burke et al, *Caffeine for Sports Performance*, 2013.

ISBN 978-1-107-43512-4

Product	Serve	Caffeine content (mg)
Oxyelite pro	1 capsule	100
Body Science (BSc) Hydroxyburn Pro	40 g	? (24 mg guarana listed on label)
Body Science (BSc) Hydroxyburn Hardcore	3 capsules	210 (70 mg per capsule)
Muscle Tech Hydroxycut Hardcore pro	40 g sachet	? [ingredients: 'caffeine']
Shred Matrix	1 capsule	? [ingredients: 'caffeine, guarana, yerba mate']
Animal Cuts	10 g	? [ingredients: 'caffeine']

Table 2.17 Fat-loss supplements

sports performance should experiment in training or less important events to determine the timing and dosages of caffeine that best suit their individual needs.

Creatine products

Creatine is a naturally occurring compound found in large amounts in skeletal muscle and the brain. Creatine is provided from dietary intake and synthesis from amino acids. The major source of creatine in the diet is from animal muscle – such as meat or fish – which typically provides 1–2 grams per day, or half the daily turnover.

As vegetarians do not consume any significant creatine in their diets, they are reliant on the body making creatine from amino acids, and typically have lower creatine levels in their muscles.

Creatine provides a number of important functions related to fuel supply in the muscle. The best-known role is as a source of phosphate to regenerate ATP, which is the most important fuel source for sprints or bouts of high-intensity exercise lasting up to 10 seconds.

Studies in the early 1990s showed that muscle creatine and phosphocreatine in skeletal muscle could be increased by around 20 per cent. These results are significant in terms of improving the exercise capacity of the phosphocreatine energy system, and have led to the widespread use and popularity of creatine among a range of athletes. Since then, further studies have shown that there is considerable variability in different athletes' responses to creatine supplementation. Individuals with the lowest initial levels, such as vegetarians, may show the greatest responses, while individuals with higher resting creatine levels may not significantly benefit from supplementation. Strategies that enhance creatine uptake into the muscle cells include taking creatine with a carbohydrate-rich meal or snack (around 50 grams of carbohydrate).

Creatine supplementation has been shown to enhance the performance of exercise involving repeated sprints or bouts of high-intensity activity, separated by short recovery intervals. Therefore, competition or training programs involving intermittent high-intensity work patterns with brief recovery periods (less than 1 minute) or resistance training programs are most likely to benefit from creatine supplementation. Performance enhancements may be seen as the result of an acute loading protocol, but chronic creatine use may offer the greatest benefits.

The best-researched dietary creatine supplement is creatine monohydrate, with a number of protocols of loading being established:

- Rapid loading may be achieved by five days of repeated doses (e.g. five doses of 5 grams) of creatine.
- Slow loading will occur over a longer period (28 days) with a daily dose of 3 grams.
- A maintenance dose of 3 grams per day will allow elevated levels to be sustained.
- Unloading: once the muscle creatine content has been saturated, it will take at least four weeks to return to resting levels.

A weight gain of 600–1000 grams is typically associated with acute loading, and is due mostly to water retention.

Creatine monohydrate is the common source of creatine in commercially available supplements, and the experience of 20 years of research indicates it is safe and effective in the recommended dosages. A number of other forms of creatine have been included in newer supplements, with claims of being a superior form of creatine; these include creatine serums, creatine malate and creatine ethyl esters. There is little to no evidence supporting marketing claims that these alternative creatine sources are more effective in increasing muscle creatine levels and achieving performance outcomes, or that they are associated with fewer side-effects.

Creatine supplementation should be limited to experienced and well-developed athletes. Young athletes are able to make substantial gains in performance through maturation and skill/technique improvements without supplementation.

ISBN 978-1-107-43512-4

Summary 2.43

1 Outline the more necessary vitamins and minerals, and explain their roles within the body.
2 How crucial is protein for athletes? Is supplementation necessary?
3 How do athletes utilise caffeine?
4 What is the value of creatine for athletes? Is supplementation necessary?

Checklist 2.44

Critically analyse the value of supplements for athletes to improve performance.

Figure 2.95 Creatine supplements are popular with athletes who train in bouts of high-intensity activity with brief recovery periods

Going further 2.45

Inquire

Source an interview of an athlete's dietary program and identify the specific nutritional and supplement guidelines this athlete follows. *Inside Sport* magazine website is a good place to start (www.cambridge.edu.au/hscpdhpe1weblinks).

Recovery strategies

Driving questions 2.46

Think back to a time when you were extremely sore and feeling fatigued after strenuous exercise.

1 What did you do to alleviate this and promote faster recovery?
2 What else do you think could have helped?
3 Consider a sport such as football or basketball and make a list of the reasons why athletic recovery is now given so much emphasis.

Recovery is the time required for the repair of damage to the body caused by training or competition, and is crucial to optimal sports performance for many reasons: some are physiological and some are psychological. Most coaches and athletes are aware that getting enough rest and recovery after exercise is essential to high-level performance; however, many are still prone to over-train and feel guilty or weak when a day off training is taken. The result is usually a loss of enjoyment and interest in training and competition, a decline in performance and eventually a state of over-training, from which it is very difficult to recover.

Clearly, athletes must work hard in order to increase the appropriate fitness qualities required to meet the demands of the sport, however, training is associated with both physiological and psychological fatigue. Well-designed training programs balance suitable training loads with strategically planned recovery strategies in order to optimise the performance potential of athletes. Peak athletic performance will only be achieved when the athlete's fatigue levels are less than

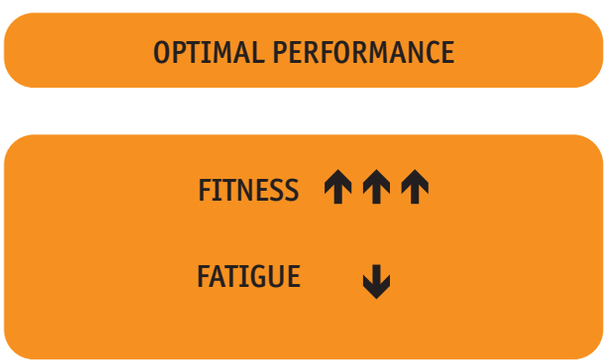

Figure 2.96 Optimal performance formula

ISBN 978-1-107-43512-4

their fitness level. Recovery strategies comprise physiological, neurological, psychological and muscle damage strategies.

Training programs that fail to balance appropriate training load and recovery strategies generally follow four distinct stages, leading to over-training:

- **Stage 1: Acute fatigue.** This initial fatigue is normal when training.
- **Stage 2: Training stimulus overload.** The overload principle states that loads greater than normal must be placed on the body in order for training adaptations to take place. With appropriate periodisation of training and recovery, training adaptation will take place. Stimulus overload that is too great will result in over-reaching and, in the worst case scenario, over-training.
- **Stage 3: Over-reaching.** The accumulation of either training or non-training stress can result in a short-term decrement in the athlete's performance capacity, with or without related physiological and psychological signs and symptoms of over-training, in which restoration of performance capacity may take several days to several weeks.
- **Stage 4: Over-training.** This involves the accumulation of either training or non-training stress that results in a long-term decrement in the athlete's performance capacity, with or without related physiological and psychological signs and symptoms of over-training, in which restoration of performance capacity may take several weeks or months.

Figure 2.97 The appropriate recovery program is necessary to achieve peak athletic performance

Basic indicators of over-training and under-recovering

- increased muscle tension and or tenderness
- increased heart rate at rest, during the workout or during the recovery period between bouts of exercise
- negative change in aerobic and anaerobic levels
- decreased appetite
- increased susceptibility to illness
- sleep disturbances
- loss of enjoyment and performance.

Figure 2.98 Recovery from over-training may take several weeks or months

Causes of overtraining

- a sharp and dramatic increase in training volume and intensity
- training that is performed too often and too intensely
- a lack of rest and recovery between sessions
- a lack of variety in sessions, resulting in boredom.

In response to training (stress), the human body attempts to maintain a state of homeostasis (internal stability), and will constantly attempt to

Figure 2.99 Poor performance formula

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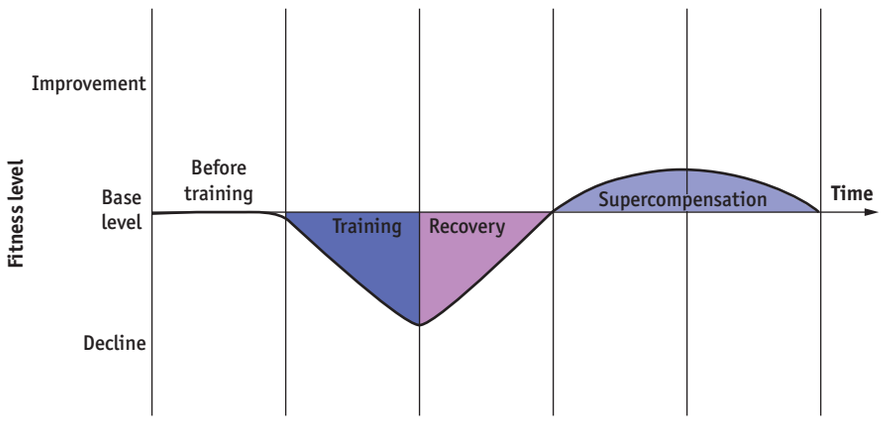

Figure 2.100 Training supercompensation – the basic principle of athletic training

adapt to the training stress. Training is simply the manipulation of the application of stress (training load), and the body's subsequent adaptation to that stress in order to maintain homeostasis. Training programs that balance load and appropriate recovery ensure that a desired adaptive response to training is achieved. This process is called supercompensation (see Figure 2.100), and was first proposed by Hungarian scientist Nikolai Jakowlew in 1976.

The human body's fitness levels are broken down into four periods: initial fitness, training, recovery and supercompensation. During initial training, the athlete has a base level of fitness (shown in the first time sector of the graph). Initially, when a training stimulus is implemented, the athlete's fitness level decreases (shown by the second time sector in the graph). Following training, the athlete's body enters the recovery period, during which the athlete's fitness level will increase up to the initial fitness level (shown by the third time sector in the graph). The adjustable nature of the athlete's body means it will take itself to a higher level of fitness in anticipation of the next training session. It is at this point that the athlete's body commences the supercompensation period (shown by the fourth time sector in the graph). If the next training session is applied during the supercompensation period, the athlete's body has a greater chance of progressing to a higher level of fitness. However, if the next training session is applied too soon during the recovery period, the athlete has a far greater chance of over-training. Conversely, if the next training session is applied too late after the supercompensation period, the athlete's fitness level will decline back towards the initial fitness level (shown by the last time sector in the graph).

The supercompensation period varies, depending on the type of training being undertaken and the volume and intensity at which it is performed. As a general rule, high-intensity explosive anaerobic sessions such as speed and strength training will require 48 to 72 hours of recovery between intense workouts in order to allow the supercompensation process to occur. Submaximal aerobic training (75 per cent intensity and lower) will require only 24 hours of recovery.

High-intensity anaerobic training and moderate-intensity aerobic training require different recovery times in order to allow the supercompensation process to occur.

Long-term recovery

Long-term recovery methods provide both physiological and psychological recovery, and refer to periods of rest and recovery that are built into the annual periodised training program. A well-designed periodised plan will include recovery days and or weeks within the annual training schedule. Coaches often add rest periods, cross-training days, social events, variations in training sessions, venues, loads and intensities – all of which are designed to promote recovery and avoid

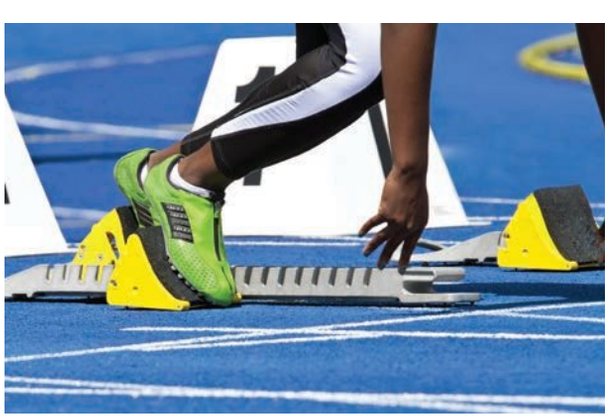

Figure 2.101 Sprint training is an example of a high-intensity explosive anaerobic session

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Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
AM:	**AM:**	**AM:**	Rest day	**AM:**	**AM:**	**AM:**
Pool recovery	Train	Train	Massage	Train	Rest	Ocean recovery
Static stretch	Ice baths	Ice baths		Ice baths		
PM:	**PM:**	**PM:**		**PM:**	**PM:**	**PM:**
Massage	Gym	Yoga class		Rest	Game	
	Stretch	Relaxation				

Table 2.18 Example of long-term recovery implementation within an in-season weekly training plan for a team sport athlete

Figure 2.102 Marathon running requires a different recovery time to sprint running

the pitfalls of staleness, boredom and over-training (see example above of a weekly program showing recovery cycles).

Physiological strategies

Cool-down

Training and competition cause changes in the body, such as muscle tissue breakdown and the depletion of energy stores (muscle glycogen), as well as fluid loss. Without sufficient time to repair and replenish, the body will continue to break down from intensive exercise. While many coaches and athletes understand the benefits of an appropriate warm-up prior to training and competition, the cool-down and its benefits are often overlooked. The cool-down provides a number of physiological benefits to the athlete to help reverse the damage caused by exercise. These include:

- gradually lowering the athlete's heart rate, body temperature and metabolism
- removal of waste products
- replenishment of energy stores and the repair of damaged tissues
- a reduction in muscle stiffness and soreness
- replenishment of fluid loss.

Hydration

The replenishment of lost fluids and muscle fuel replacement are the two most critical components of recovery following training and competition. A body weight fluid loss of 2 per cent or more during exercise may result in a drop in aerobic endurance, an increased risk of soft tissue injury, losses in concentration and reduced reaction time. It is essential that athletes are educated in relation to hydration. Regular urine hydration checks and pre- and post-session weighing in order to monitor individual athlete sweat rates are essential. A loss of 1 kilogram equates to 1 litre of fluid loss. It is generally recommended that, in order to replenish 1 litre of lost fluid, it is necessary to consume 1.5 litres of fluid.

Figure 2.103 Hydration is a crucial component of recovery

Nutrition

Appropriate nutritional replenishment following training requires planning, and must balance the demands of the exercise. Muscle glycogen supplies within the muscles and liver not only fuel energy demands, but are critical in the recovery process following training and competition.

When food and/or sports drinks containing CHO are consumed, blood glucose levels in the blood elevate quickly and peak at about 20–30 minutes. The glycaemic index (GI) of a food or sports drink is determined by the rate at which CHO is available

High (GI >85)	Moderate (GI = 60–85)	Low (GI <60)
White bread	Pasta/noodles	Apples/pears
Wholemeal bread	Popcorn	Cherries
Nutrigrain	Porridge	Peaches
Cornflakes	Potato chips	Apple juice
Weetbix	Special K	All Bran
Potato	White rice (boiled)	Baked beans
Rockmelon	Sweet corn	Lentils
Raisins	Sponge cake	Ice cream
Bananas	Oranges	Yoghurt
Corn chips	Orange juice	Fructose
Sugar/honey	Chocolate	Brown rice
Cordial/sports drinks		Milk (all types)
Glucose		Peanuts

Table 2.19 Glycaemic index of various foods

for glycogen resynthesis in muscles and the liver. The higher the GI, the more rapid the absorption (see Table 2.19).

Athletes should aim to consume 1 gram of high glycaemic index carbohydrate per kilogram of body mass immediately after exercise. This process should be repeated after one hour of completing the exercise. Snacks or sports drinks containing a moderate level of protein and carbohydrates are recommended, especially after hard training. For strength, speed, power and impact, team sport athletes' post-session snacks should contain 10–20 grams of protein (6–12 grams of amino acids) in addition to high GI carbohydrate, to have a substantial effect on net protein synthesis. As a general rule, a 4:1 ratio of carbohydrate to protein is recommended (see box below for carbohydrate and protein snacks, and carbohydrate snacks).

Going further 2.47

Create

Select a team sport or individual athlete and design an appropriate recovery session by utilising the physiological recovery methods discussed above. Discuss the physiological benefits of each recovery method for the team or athlete.

Neural strategies

Hydrotherapy and massage promote relaxation of muscles that may have sustained damage or fatigue during high-intensity exercise. The integration of neural recovery strategies into the recovery program is common in many contact team sports (see NRL example later in this chapter).

Carbohydrate and protein snacks

50 g carbohydrate snacks providing at least 10 g protein

- 250–350 mL liquid meal supplement
- 250–350 mL milkshake or fruit smoothie
- 500 mL flavoured low-fat milk
- Many sports bars (check labels for protein and carbohydrate content)
- 60 g (1.5–2 cups) breakfast cereal with half a cup of milk
- 1 round of sandwiches, including cheese/meat/chicken filling, and 1 large piece of fruit or 300 mL sports drink
- 1 cup fruit salad with 200 g carton fruit-flavoured yoghurt or custard
- 200 g flavoured yoghurt or 300 mL flavoured milk and 30–35 g cereal bar
- 2 crumpets or English muffins with thick spread of peanut butter
- 250 g baked beans on 2 slices of toast
- 250 g (large) baked potato with cottage cheese or grated cheese filling
- 150 g thick-crust pizza

Carbohydrate snacks

50 g carbohydrate snacks

- 800–1000 mL sports drink
- 800 mL cordial
- 500 mL fruit juice, soft drink or flavoured mineral water
- 60–70 g jelly beans or jube sweets
- 2 sports gels
- 3 medium pieces fruit or 2 bananas
- 1 round thick-sliced jam or honey
- 2 large (35 g) or 3 small (25 g) cereal bars
- 1 large chocolate bar (70–80 g)
- 3 thick rice cakes with jam or honey
- 2 crumpets or English muffins with vegemite
- 1 cup thick vegetable soup with large bread roll
- 1 jaffle/toasted sandwich with banana filling
- 100 g (1 medium or 2 small) American muffins, fruit bun or scones
- 250 g (1 cup) creamed rice
- 250 g (large) baked potato with salsa filling
- 100 g pancakes (1–2 large) + 30 g syrup

Source: Australian Institute of Sport, Nutrition for optimal recovery after training and competition.

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Going further 2.48

Inquire

Weigh yourself on the scales. Using the recommended post-session nutritional requirements provided, give examples and discuss the amount of CHO and protein required following a resistance training session.

Hydrotherapy

Hydrotherapy uses water to assist recovery, remove waste products, soothe aching muscles, promote metabolic recovery and provide the perfect environment to eliminate joint load and jarring. Water hydrotherapy includes showers, jets, spas, baths, flotation tanks, underwater massage, pools and plunge pools (hot and cold). Many contact team sports in Australia utilise the gravity-assisted advantages of hydrotherapy in the post-game recovery program.

Contrasting hot and cold water immersion provides neural stimulation within the central nervous system, increasing the sensation of arousal and alertness in an athlete and minimising the effect of delayed-onset muscle soreness. Athletes need to be reminded to drink water before, during and after hydrotherapy treatments, as sweating tends to go unnoticed in hot-water environments. Athletes tend to spend too long in a warm environment. In extreme cases, prolonged immersion in hot water can be detrimental, as it can lead to dehydration and neural fatigue. Following hydrotherapy, athletes should feel relaxed and alert, not sleepy and lethargic.

General guidelines for the use of baths, showers and spas

Spa or bath, with contrast shower or cold plunge pool

Alternate hot (39–40°C) and cold (10–12°C)
Spend three to four minutes in the hot, then spend 30–60 seconds in cold
Repeat 3 times

Showers

Can be used at any time
30 seconds warm to hot, then 30 seconds cold
Repeat 3 times
Always take a bottle of water or sports drink

Source: Angela Calder, *Recovery training*, Australian Institute of Sport.

Massage

The physiological benefits of sports massage include increased blood flow, oxygen and nutrient transfer to the fatigued muscles, and the removal of metabolic waste products such as lactic acid. Massage also provides temporary flexibility gains by warming and stretching the muscles. Psychologically, massage allows athletes to feel less fatigued and more relaxed. Massage also provides feedback for the athletes in relation to the areas of the body that are fatigued, tight and sore.

While massage can be expensive for many athletes, simple self-massage techniques are free, quick and easy to administer, yet can be an effective way to minimise shin splints and repetitive strain problems.

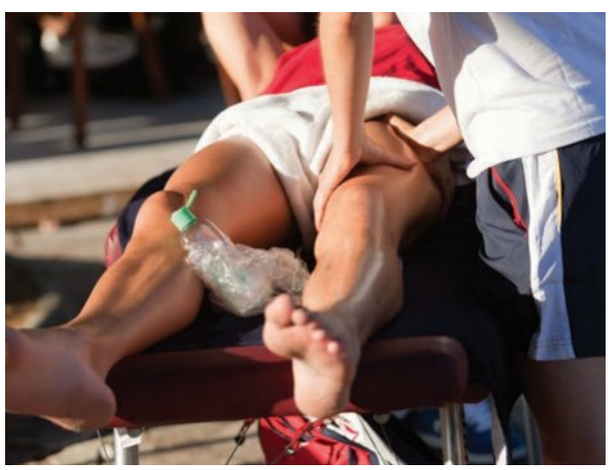

Figure 2.104 Sports massage provides athletes with many benefits

Sports massage techniques

There are a variety of massage techniques that can be incorporated into sports massage, including:

- vibration (shaking)
- tapotement (percussion)
- petrissage (kneading)
- effleurage (stroking)
- friction (small-range intensive stroking).

Sports massage incorporates varying combinations of massage techniques, and can be administered during all phases of training.

Massage performed 15 to 20 minutes prior to the session or competition can either relax or stimulate the athlete, depending on the methods adopted. Within the training session, short periods of massage can help athletes cope with the training loads and increase their performance potential. Restorative massage helps reduce muscle tension, fatigue and stress levels.

Injury-prevention massage is generally performed two days after competition, and helps to promote muscle relaxation and return muscles to their 'normal' resting state.

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Foam roller (an alternative to massage)

Foam rollers have become extremely popular among professional athletes over the last few years. They provide a cheap and effective alternative 'self-massage' for athletes who are unable to pay for daily massage. Self-foam rolling, either before or after training, allows athletes to focus on tight, sore muscles and assist in ensuring that muscles remain supple.

Figure 2.105 Foam rolling is a relatively new method for athletes to administer 'self-massage'

Tissue-damage strategies

Cryotherapy, or cold therapy, involves the use of low water temperatures to dissipate body heat from the body, and is extremely effective in reducing pain and inflammation, and removing waste products from the muscle. Cryotherapy may enhance recovery by restricting the inflammatory process. Cryotherapy methods include:

- cold-water immersion
- contrast bathing
- local ice application.

Cold-water immersion

Cold-water immersion involves athletes entering a cold-water bath (4–12°C) for a short interval of one to two minutes followed by 30 seconds' rest; this process is repeated three to four times. While the physiological benefits of cold-water immersion are not well understood, it may be useful for reducing swelling, soreness and bruising, and is often used in the acute treatment of muscle injuries. Athletes generally report feeling better, with reduced stiffness and tightness, following cold-water immersion.

Cryogenic chamber therapy

Wearing only a bathing suit, socks, gloves, mouth and ear protection, the athlete is placed in a cryogenic chamber that is cooled using liquid nitrogen to a temperature of –110°C. While exposure does not exceed three minutes, the athlete's skin temperature may drop to 5–12°C; however, the athlete's core temperature remains relatively unchanged. Such exposure to extreme cold for short durations releases endorphins, providing instant pain relief.

Figure 2.106 During cryogenic chamber therapy endorphins are released and pain is instantly relieved

Ice pack therapy

An ice pack is placed over the injured area, promoting immediate vasoconstriction (decreased blood vessel diameter), reducing heat, and decreasing metabolism and blood circulation. Upon removal of the ice pack, blood vessels vasodilate (expand), resulting in fresh oxygen-rich blood full of nutrients flowing to the muscle, thus stimulating recovery and removing lactic acid.

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Figure 2.107 Applying an ice pack enables the flow of fresh oxygen-rich blood to the injured muscle

Psychological strategies

While many coaches apply physiological methods of recovery within the training program, the importance of psychological recovery is often overlooked. The psychological benefits of sound recovery practices include increased motivation, a sense of well-being and the reduction of training and/or life stress. Psychological recovery methods include the following:

Meditation

Meditation trains the athlete's ability to relax the mind, and is a useful tool for helping athletes to control the stress of training, competition and over-arousal. This is achieved by relaxing the parasympathetic (calming) nervous system. Meditation has a number of benefits, including:

- lower heart rate
- lower breathing rate
- lower blood pressure
- relaxation of the muscles
- calming of the sympathetic (excitatory) nervous system.

Like training, meditation is a learned skill that takes time to master.

Progressive muscle relaxation

Progressive muscle relaxation (PMR) is a technique that involves tightening and holding a specific muscle for five seconds before relaxing. Generally, PMR commences from either the feet or the head, and gradually works its way up or down the body. PMR is best adopted either following training or prior to going to bed. Like any skill, PMR requires practice, but once the athlete becomes familiar with PMR training, they will be able to identify the difference between muscle tension and relaxation.

Mental imagery and visualisation

Mental imagery and visualisation involve the athlete using the senses of sight, sound, smell and touch to visualise a state of relaxation, enjoyment, escapism and comfort. Mental imagery and visualisation can be used prior to going to bed in order to switch off and relax. Alternatively, the athlete can use mental imagery to visualise a positive performance or the perfect execution of skills prior to games or training.

Breathing exercises

Breathing exercises are used frequently in the martial arts. They help to relax tight muscles, the result of which is more efficient movement, technique and improved posture. Focusing on breathing during stretching also assists in relaxing both the mind and body. Breathing in through the nose and expanding the rib cage is the most effective method during inhalation, while breathing out through the nose during exhalation is also important.

Figure 2.108 Meditation has a number of benefits for the body and the mind of an athlete

Figure 2.109 Mental imagery and visualisation can be a powerful tool of both relaxation and performance

Flotation for rest and relaxation

Relaxing in a flotation tank or using buoyancy vests in a pool can be useful for promoting a state of weightlessness and relaxation. Flotation takes time to feel completely comfortable; however, it is an excellent method for reducing stress and burn-out. By minimising brain stimulation, the athlete is able to focus more effectively on relaxing and becoming emotionally calm.

Music

Many athletes enjoy listening to music; however, very few use it effectively as a method of recovery. While it is often used to 'pump up' athletes prior to an event, music can be just as effective in promoting relaxation if the appropriate music is selected. By compiling a variety of music to promote either relaxation or arousal, the athlete can manipulate its use. Used prior to going to bed, light, relaxing music is useful in promoting a deep, sound sleep.

Figure 2.110 Light, relaxing music before bed can promote restful sleep

Other recovery methods often implemented among professional athletes

Wellness monitoring

Many professional strength and conditioning coaches working with team sport athletes require the athlete to provide information relating to body weight, sleep quality, stress levels, fatigue, training enjoyment and muscle soreness. Wellness monitoring encourages an athlete to monitor and recognise the body's physiological and psychological responses to training, competition and general lifestyle. Data also allow the coach to monitor how the athlete is responding to the demands of training and competition, and to individualise training loads accordingly.

Compression garments

Compression garments are increasingly being used as a mode of recovery among many professional team sport athletes. Very few research studies have examined the efficacy of these garments in improving recovery; however, compression garments may:

- enhance blood circulation to peripheral limbs
- reduce blood lactate concentration during maximal exercise bouts
- enhance warm-up via increases in skin temperature
- aid the removal of blood lactate and improve subsequent exercise performance
- reduce the effects of delayed-onset muscle soreness.

While there are many methods of recovery available, sleep, nutrition and hydration are the big three that are necessary for all athletes.

Summary 2.49

1 Outline physiological recovery strategies, providing examples.
2 Outline neural recovery strategies, providing examples.
3 Outline tissue damage recovery strategies, providing examples.
4 Outline psychological recovery strategies, providing examples.
5 Create and evaluate a post-game recovery protocol for a professional team sport athlete.

Checklist 2.50

Research the main features and proposed benefits of a range of recovery strategies.

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NRL recovery

The following is an example of a recovery protocol implemented among National Rugby League players following an NRL game.

During an NRL game, players cover upwards of 8 kilometres at an average heart rate of around 165 bpm. Following the game, the players are in a state of muscle catabolism (muscle breakdown), so it is imperative that active recovery methods are implemented as soon as possible in order to promote muscle recovery (anabolism) and the replenishment of fluids and muscle glycogen stores as quickly as possible.

Step 1: Replenish lost fluids and energy stores lost during the game

When the players return to the dressing room following the game, they weigh in to assess the amount of fluid lost during a game. It is not uncommon for players to lose in excess of 3 litres of fluid during the course of a game. Players commence fluid intake in order to replenish hydration stores. Within 15 minutes of the players finishing the game, they consume a liquid post-exercise sports drink that contains both carbohydrates and amino acids.

Step 2: Low-intensity aerobic exercise and flexibility (cool-down)

The players commence 5 to 10 minutes of light aerobic exercise on stationary bikes. Low-intensity aerobic exercise promotes blood flow to the muscles and assists in the removal of lactic acid and waste products that build up as a result of exercise. Low-intensity aerobic exercise also promotes the transfer of nutrients to the muscle to assist recovery.

Light static stretching follows the light aerobic exercise, and helps to restore muscle length to normal. Players' muscles become extremely tight following games. Each static stretch is held for around 15 seconds.

Step 3: Contrast baths

The players perform three to four cycles of 30 seconds of cold (10–12°C) and two to three minutes of hot (39–40°C). The process of vasodilation (expanding) and vasoconstriction (constriction) of the blood vessels sends oxygen to the muscles, and assists in nutrient transfer and the removal of waste products.

Step 4: Nutritious meal and continued hydration

The players sit down with family and friends, and consume a meal containing high carbohydrates and moderate protein food options in order to further promote the replenishment of muscle glycogen and protein synthesis. Players continue the process of rehydration during this time. Rehydration may take 24 to 48 hours, depending on the level of dehydration. Psychologically, sitting down with family and friends allows the players to mentally unwind and relax following the game.

Step 5: Sleep

Getting quality sleep – at least eight hours – is also an important part of short-term recovery. Sleep and rest are necessary for soft-tissue (muscles, tendons, ligaments) repair and the removal of chemicals that build up as a result of cell activity during exercise.

Figure 2.111 In Step 2, players cool down by doing 5 to 10 minutes of low-intensity aerobic exercise on stationary bikes

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2.4 The impact of the acquisition of skills on performance

Driving questions 2.51

1 What was the last physical skill you learned?
2 How long was it until you felt confident performing the skill?
3 What factors made learning this skill easier or more difficult?

Stages of skill acquisition

Cognitive

The cognitive stage is the initial stage of learning a new skill. It is essential the athlete gains an understanding of the skill and how it can be applied to their sport. The process might begin by watching the skill performed by someone who is proficient and then breaking it down into smaller components for teaching. The stimulus given to the athlete in the form of videos and demonstrations must be balanced so as not to overload the athlete with information that may cause confusion and anxiety.

The physical practice of the skill is critical to this stage. The complexity of the skill will determine how many steps the teaching and practice is broken into, and how long it will take to move to the next stage. A coach will use drills as a way of breaking the skill into smaller components. As these drills are mastered, the athlete can start linking the entire skill together. While practising in the cognitive stage, athletes will typically make errors and require external feedback from the coach/teacher to help guide them. In most cases, positive reinforcement when something is done well must be a feature of the coach's feedback. The use of negative and defamatory language is usually of little assistance to the athlete.

The two biggest factors dictating how quickly it takes an athlete to move beyond the cognitive stage are the coach and the complexity of the skill. Some athletes may take as little as a few minutes or as long as many weeks to learn a new skill. Visualisation, or mental rehearsal, is a sound coaching strategy during this stage. Visualising the successful execution of the skill can be quite beneficial.

Associative

The second stage of skill acquisition is referred to as the associative stage. This stage is characterised by less tuition from the coach and more practice from the athlete. During this stage, the athlete is doing less of the drills and is more focused on practising the entire movement involved in the new skill. Errors still occur, but with frequent practice these will be reduced and the athlete will begin to gain some fluency in the execution of the skill. Feedback from the coach is still important, but through greater understanding the athlete will begin to be able to provide some of their own feedback as well. This is an important point in the acquisition of the new skill because, as the athlete begins to feel more proficient, their confidence also increases. The increased sense of confidence is a critical step in the psychology of the athlete, as it represents the point at which the athlete feels comfortable performing the skill. With confidence and ability, the athlete can move to the third stage of skill acquisition. Some athletes, however, remain at this stage, and never get to a level where the skill can be performed automatically.

Autonomous

The third and final stage of skill acquisition is the autonomous stage. As the name suggests, at this stage the athlete performs the skill automatically. They need not consider and plan the skill's implementation – it can simply be performed consistently and accurately when required. They are able to link the sub-routines together easily and in the correct order. Although there may be some errors, these are very occasional and are generally corrected quickly without external feedback. The skill is executed efficiently, effectively and in a way that is visually attractive. When this level of execution is practised, the athlete can be in a state of physical and psychological harmony. This state is referred to as 'flow'.

When athletes perform skills autonomously, they have great ability to attend to all the other

Summary 2.52

Outline the three stages of skill acquisition.

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Checklist 2.53

Examine the stages of skill acquisition by participating in the learning of a new skill, such as juggling or throwing with the non-dominant arm.

demands of their sport. For example, when a skill is autonomous, the athlete can pay greater attention to reading the play and making the correct decisions as far as who to pass the ball to or which weakness in the opposition to exploit.

Characteristics of the learner

Personality

Personality represents the common characteristics that shape an individual's pattern of behaviour. Personality is developed over a lifetime as a result of our ongoing social interactions; however, common behaviours form what is referred to as one's character. The personality traits of an athlete will determine the rate at which they acquire new skills and how well they can apply them. For example, athletes who are enthusiastic, reliable and determined will be more likely to apply themselves to training and preparation than those who are lazy and unmotivated. Even at elite levels of sport, coaches target athletes for their positive attitude as well as their raw talent.

Heredity

The heredity of an athlete is the major factor that determines their potential to succeed. These are the psychological characteristics, physical attributes and biology that are passed on from the athlete's parents. It is not uncommon for elite athletes to have parents and/or siblings who have also been highly successful at their sports. Such characteristics as height, body shape, limb length, personality, intellect, games sense and much more are directly impacted upon by one's genetics. However, while the athlete can inherit many wonderful qualities from their parents, it is important for these qualities to be nurtured. Simply being born with natural sporting talent is no guarantee of sporting success. The environment in which the athlete grows up, the access the child has to skill development and the hard work the athlete is willing to put in can all either help or hinder what genetics has provided.

Confidence

Confidence develops through prior success, and represents the belief that a person will succeed. To be confident, an athlete must strike a balance. An athlete who believes they can achieve something difficult is far more likely to succeed than the athlete with self-doubt. For this reason, confidence is critical to the acquisition of new skills. Athletes must believe they can complete the skill autonomously, even before they actually can. It takes supreme confidence to believe in one's ability even when things like learning a new skill are difficult and seem unattainable.

Prior experience

Prior experience is another factor that will influence an athlete when learning a new skill. It involves a transfer of learning. An athlete who has already sampled something similar will have physical skills that may be transferable, and confidence that they can use their prior experience to accelerate their learning curve. A good example of prior experience and its influence on learning new skills is diving. Many Olympic-level divers have been gymnasts for many years. Gymnasts already possess a mastery of their movement, and can easily flip, tumble, turn and contort their bodies into the necessary positions for success in diving. There are many examples of elite athletes who have changed sports and succeeded in transferring their skill base. Prior to winning the Tour de France, a road cycling event, Cadel Evans was a world champion cross-country mountain biker.

Ability

Ability represents the athlete's performance. How well can the athlete take all the different

Summary 2.54

Outline the characteristics of the learner that impact on skill acquisition.

Checklist 2.55

How do the characteristics of the learner influence skill acquisition?

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skills and apply them in a competitive arena? An athlete with high levels of ability (often inherited) can consistently acquire the new skills faster. An athlete who does not possess the natural ability will need to work harder and demonstrate greater determination if they wish to succeed. For example, cricketer Sir Donald Bradman not only attained the established skills of batting more easily than most, but revolutionised new skills that his contemporaries tried to emulate.

Figure 2.113 Ten-pin bowling also requires the use of open skills

The learning environment

The learning environment refers to all the external influences on athletes while they are learning new skills. Elements like the weather, the playing surface and the coach's feedback are examples of the learning environment.

Nature of the skill

The first area to consider in the learning environment is the nature of the skill. Skills can be defined and categorised. Most are classified into one or more of the following categories:

- open or closed skills
- gross motor or fine motor skills
- discrete, serial or continuous skills
- self-paced or externally paced skills.

Open and closed skills

Closed skills are those that are executed in a controlled and stable environment, or one that is the same every time the skill is repeated. A closed environment is difficult to create, and is not seen in many competitive sports. An open skill refers to skills performed in a dynamic environment. The open skill is performed accurately in spite of the environmental influences. Closed skills are often useful when learning. This allows the athlete to concentrate on the skill; however, as they become more proficient, the coach will introduce other elements to make it an open skill.

For example, if a batsman in cricket wants to learn the square cut, the athlete may begin by setting a bowling machine to bowl the ball in the perfect position every time for a square cut. The athlete would also train in the indoor net on the same surface every time, as this would create a more closed environment. As the batsman becomes more proficient at the shot, the coach can introduce different bowling speeds, varying bowling lines and lengths as well different surfaces and outside pitches, thereby making the skill more open. Defining a skill as open or closed is difficult because most skills tend to lie on a continuum. Some are more open than closed while others progress back and forth on the continuum, depending on the environment.

Figure 2.112 Surfing is a sport that requires open skills

Gross and fine motor skills

Gross motor skills are those that require large muscle groups to execute them – for example run, hop, skip, jump. Alternatively, fine motor skills require only small muscles to execute the skill. Fine motor skills are more delicate, and the most

Going further 2.56

Inquire

1 Place the following sports onto a continuum from closed to open skills:
   - ten-pin bowling
   - lawn bowls
   - basketball
   - surfing.
2 Place the following skills (all during a game) onto a continuum:
   - basketball free throw
   - basketball lay-up
   - basketball dribble
   - basketball pass to restart play.

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Figure 2.114 Soccer requires the use of gross motor skills

common examples are things like writing, cutting and drawing. Fine motor skills in sports are more difficult to identify, as most sporting performance uses gross motor skills. Sporting examples come from more sedentary activities like chess, darts and putting.

Going further 2.57

Inquire

Place the following sports onto a continuum from gross to fine motor skills:

- **kicking a ball**
- **swimming**
- **dart throwing**
- **weightlifting.**

Discrete, serial and continuous skills

Skills can also be classified based on the process or steps it takes to complete them. The simplest classification is of a discrete skill, which can be defined by having a clear starting and finishing point – for example, catching a ball in basketball.

Figure 2.115 Darts is a sport that requires fine motor skills

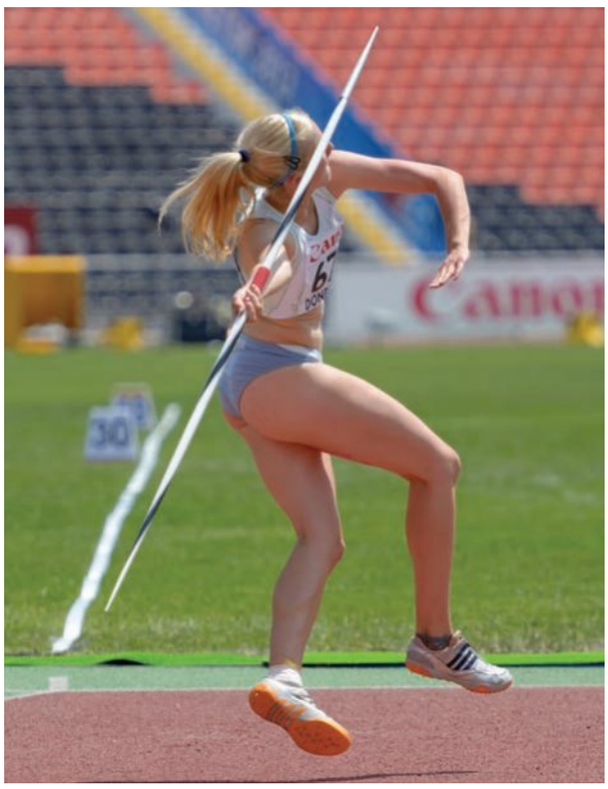

Figure 2.116 Javelin throw requires a serial skill of run-up, pitch and throw, all as one skill

A serial skill is one that links together several discrete skills. A lay-up in basketball is an example of a serial skill; the athlete must dribble, jump and shoot, all as one skill. The next classification is a continuous skill, which is repetitive and ongoing – for example, dribbling or running in basketball.

Self-paced and externally paced skills

Pacing is another classification factor when considering the nature of the skill. Specifically, the skill is defined as either self-paced or externally

Figure 2.117 Competition is the time when an athlete's proficiency at a skill will come to the fore

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Going further 2.58

Inquire

Place the following skills onto a continuum from discrete to serial to continuous:

- swimming
- javelin throw
- kicking a goal in Rugby Union
- surfing.

paced. Self-paced skills are those in which the athlete controls the timing – for example, a tennis serve. An externally paced skill is controlled by factors outside of the athlete's control – for example, returning the tennis serve. Another example in cricket is where the bowler is self-paced while the batsman is externally paced.

Going further 2.59

Inquire

Place the following skills onto a continuum from self-paced to externally paced skills:

- tennis serve
- tennis return
- ten-pin bowling
- a tackle in Rugby League.

The performance elements

The performance elements are critical for the athlete's success in a competitive environment. While athletes may demonstrate proficiency at a skill during practice, they must also be able to apply it during competition. In addition to building the skill, the coach must develop performance elements like decision-making, and strategic and tactical awareness. While skill development is fundamental to any training session, as the athlete progresses the coach should use techniques that develop the skills through competitive games. This is referred to as the game-centred approach. A soccer coach who gets their players to practise passing through small-sided games is applying this principle. In this scenario, the soccer players enhance their passing game while in an open environment in which they have to balance all the uncontrolled environmental factors like surface and defence.

Decision-making is a skill that can only be learnt through experience. Knowing when to pass the ball or draw a player, or which opposition weakness to target, is a crucial performance element that needs to be developed. Presenting athletes with scenarios that are both theoretical and practical is a good way to develop decision-making skills. Taking time out after training and competition to debrief specific decisions and their level of success can ensure continuous improvement.

The athlete who can manipulate a game to their advantage is said to have strategic and tactical

Figure 2.118 Strategic and tactical awareness can allow an athlete to manipulate a game to their advantage

Figure 2.119 Strategy can make the difference between winning and losing

Going further 2.60

Inquire

1. Research TGfU or the Game Sense Model. What does the model involve? What are its advantages and disadvantages?
2. Research the advantages and disadvantages of other instructional methods.

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awareness. The knowledge and confidence to take leadership of a situation so as to ensure the best possible result for the athlete, and possibly the team, is immensely powerful in sport. More often than not, opponents can possess similar skills and ability: it is strategy alone that makes the difference between winning and losing. In soccer, coaches and players implement formations targeted at guaranteeing their team's strengths and exposing the opposition's weaknesses.

Practice method

Massed and distributed practice

Massed practice is when the session is all blocked together and no break is taken. This is ideal if the training schedule does not allow for multiple days of practice or the athlete is highly motivated. A coach may assign an hour of training time to a particular skill. Massed practice is suitable for discrete and simple skills. This type of training is beneficial for beginners, as they can consolidate their learning.

Distributed practice is when the rehearsal session is broken into smaller parts, or is interspersed with small breaks. This is a good way to learn complex skills as the athlete can remain free from fatigue and apply their concentration. In a distributed form of practice, the coach would implement the skill rehearsal in four 15-minute blocks across four days. Distributed practice is suited to continuous and complex skills, as well as skills that may result in injury.

Whole and part practice

Whole practice is a method in which the whole skill is practised in its entirety. This type of practice allows the athlete to get a sense of the skill while also developing their kinaesthetic sense.

Part practice involves breaking a skill down into its components and rehearsing each component separately before combining them into the whole skill. This is suitable for complex skills.

Feedback

Feedback is a process by which information about a past or present event is provided. The information may come internally or externally, during or after the event, and/or as result within a game. Feedback is very important as part of the learning process

Summary 2.61

1 Outline the nature of skills and provide examples.
2 Outline the performance elements and provide examples.
3 Outline the various practice methods and determine which method would suit beginners versus advanced performers.
4 Outline the various forms and feedback and determine which would be suited to beginners and advanced learners.

Figure 2.120 Feedback is an important tool in shaping improvement and development

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because it helps to shape improvement and development.

Internal and external feedback

Internal feedback is received from signals within the body. These are sometimes referred to as proprioceptive signals. The skill is performed, and during the execution the athlete can judge the success by the way it feels. For example, an AFL player kicking a goal knows when their foot strikes the ball whether they did so in a manner that was appropriate and in line with what they should feel if they are going to score a goal. Quite often, players indicate that they know a goal will be successful a long time before it goes between the posts simply because it 'felt good off the boot'. External feedback is when the information comes from a source outside the body. The type of external feedback can vary from a crowd's applause at their approval to video analysis with a coach. Scoreboards, stopwatches, team-mates, parents and coaches all provide external feedback.

Concurrent and delayed feedback

The moment at which feedback is received will also play a part in the learning process. Feedback that is received at the time when the skill and or movement is performed is referred to as concurrent (continuous) feedback. This feedback occurs simultaneously with the skill being performed. Concurrent feedback is always internal. The AFL kicker in the above example also experiences concurrent feedback.

Delayed feedback occurs after the event. An example would be when a golfer hits the ball. The feedback comes in the form of where it lands on the fairway.

Knowledge of results and performance

Feedback can also be classified in terms of results and performance. An athlete's knowledge of results represents one variety of this feedback. Knowledge of results comes after the skill has been executed, and takes its form in how many goals were scored, the time it took and so on. For example, a netball shooter may take 36 shots in a game and score 34 goals. This knowledge of the result helps to provide feedback.

Knowledge of performance also provides feedback through more specific skills-based indicators. For example, after the netball game in which the shooter scored 15 goals from 36 attempts, the coach may talk through with the athlete technical points such as hand position on the ball, position to the net and the angle of release.

Figure 2.121 Knowing details about technique during a game can help a netball player improve their performance

The knowledge of performance provides direct information about the quality of execution. The kinaesthetic sense of an athlete can also provide knowledge of performance. Often athletes can be happy with their performance despite the result, due to the quality of the performance. The opposite is also true, with an athlete achieving victory despite playing badly. Both situations still provide the athlete with useful feedback.

Checklist 2.62

Design a plan for teaching beginners to learn a skill of your choice. They should learn the skill to mastery. In your plan, consider:

- **practice methods**
- **performance elements**
- **characteristics of the learner**
- **feedback.**

Assessment of skill and performance

Gathering information about the athlete's performance is important, and will be used to shape future training programs, highlight weaknesses and

Driving questions 2.63

Reflect on the last competitive game you watched.

1. **Who won?**
2. **How was this decided?**
3. **If you described the game to a friend, would you use any other information to describe the quality of the performances?**

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suggest areas for development. The gathering and assessment of performance data is popular across professional sports, with many software products available to help analyse an athlete's performance.

Characteristics of skilled performers

Close observation of an athlete who demonstrates not only proficiency but mastery of a skill will highlight key characteristics. The characteristics of a skilled performer include kinaesthetic sense, anticipation, consistency and technique, as well as their mental approach.

Kinaesthetic sense

This is considered the 'sixth sense' for athletes. The ability to feel and sense their movements is part of their autonomous performance. Thus they can correct and tweak their performance mid-movement or game. The kinaesthetic sense of a highly skilled athlete is one of their greatest weapons. This is demonstrated when an athlete is able to 'feel' what is happening, and know how they need to adjust even the smallest of movements to adapt to and conquer the situation. Former surfing world champion Kelly Slater showed tremendous kinaesthetic sense at the height of his career. He would regularly make small adjustments to his movements while surfing, depending on the prevailing conditions. His kinaesthetic sense presented itself as a fluid, technical and entertaining form of surfing never seen before.

Anticipation

Anticipation is the ability of someone to predict an outcome and act accordingly. A skilled performer with anticipation is able to stay ahead of their opponent using their instinctive awareness to counter them. In field hockey, an athlete with good anticipation is able to predict the direction of a pass, which space to manoeuvre towards and which way an opponent may strike the ball for a shot. This player tends to be ahead of the game, and therefore has greater time to respond. Through time and experience comes greater capacity for the athlete to outplay their opponent.

Consistency

Consistency is the ability to do something repeatedly and achieve the same result. A skilled performer is said to consistently perform at a high level. This simply means that they can perform their chosen skill under the pressure of competition and achieve great results. For example, the best basketballers consistently make their shots. An unskilled performer will fail to make the majority of their shots – sometimes they get a couple of good shots but on other occasions they miss badly. Most people can execute a particular skill reasonably well; however, the skilled performer can execute the same skill to a higher standard repeatedly. This consistency is very important in maintaining form across long seasons or during a game that requires constant attention and focus.

Figure 2.122 Basketball players demonstrate well-developed technique on the court

Technique

The technique of a skilled performer is an important characteristic. Technique is the procedure and method of executing the skill. The athlete with a superior technique has absolute control over their body and how it delivers the desire outcome. With well-developed technique comes efficiency and economy of movement, less chance of injury, greater kinaesthetic sense and, most importantly, a greater chance of performing the skill successfully.

Mental approach

The mental approach is often said to make the difference between champions. Many athletes are physically gifted and train exceptionally hard, yet never succeed. Therefore, the mental aspect of an athlete must play a role in success at the elite level.

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Going further 2.64

Inquire

Read the article on Michael Phelps on the USA.com website (see www.cambridge.edu.au/hscpdhpe1weblinks). What made Michael Phelps successful?

Objective and subjective performance measures

To measure performance enables the coach and athlete to study and analyse their performance and that of an opponent more closely. Measurement normally involves gathering information and data. There are two styles of measurement:

- objective measurement
- subjective measurement.

To objectively assess something, the judge must use a concrete measuring tool like a tape measure. When a long jumper lands in the sand, the judge measures the distance of the jump with the tape measure. The distance they have jumped cannot be disputed. This is an objective measure, and is said to be more reliable.

A subjective assessment is based more on opinion. For example, while long jump, high jump and sprint races all have objective measurement tools, a gymnast or a diver is judged on the basis of someone's opinion, and hence this is a more subjective form of assessment. Sports that are measured subjectively often attempt to mitigate certain factors in order to create a more objective measure. Gymnastics judges must be experienced, impartial and able to apply the judging criteria. Most athletes and coaches favour the measurement tools that are more objective, as the results have greater reliability.

Validity and reliability of tests

Validity and reliability are two characteristics that establish the credibility of an assessment. If these characteristics are lacking, the results could be inaccurate or misleading.

The validity of the test is defined by its ability to measure what it intends to. For example, a sit-and-reach test is a valid test of hamstring flexibility. This is proven, as the range of movement required comes through the hamstring muscle and surrounding joints. If the sit-and-reach test were used to measure shoulder flexibility, it would be an invalid test. Validity requires the test and the subject being measured to share a relationship. While a shuttle-run test is a valid measure of cardiorespiratory fitness in a runner, it would be an invalid test of strength. Significant work is often required to establish the validity of a test.

Reliability is a measure of consistency. Can the test achieve the same result if repeated? For example, if the sit-and-reach test is repeated again and again on the same subject, does that person achieve the same or similar results? There is often a plethora of variables that can potentially influence an assessment or test. In the case of sporting tests, the variables may include weather, opponents, equipment, surface and so on. If the test is to be regarded as reliable, it is important that these variables are controlled. This is why ergometers are often used to test power, speed and oxygen capacity. For example, if a rowing athlete wanted to test their power output, they would be best to use a rowing ergometer. The ergometer would be set up inside, and variables like temperature, wind resistance and water conditions could thus be controlled.

Going further 2.65

Inquire

Use the guidelines on the Surfer Today website (see www.cambridge.edu.au/hscpdhpe1weblinks) to score a selection of surfing waves.

1. **Did you score the same as your classmates?**
2. **What could you do to make these criteria more objective?**

Personal versus prescribed judging criteria

There are two recognised measures for judging: personal or prescribed criteria. A personal criterion is judgement that is based on opinions, feeling and emotions about the performance. Often, coaches may use instinctual understanding and their personal judgement to choose a team. Spectators and fans always use personal criteria to assess the performance of everyone, from their favourite player to the umpire. This is a subjective form of appraisal.

A more complex and objective way to make a judgement is to apply a prescribed criterion. The application of prescribed judging criteria is common in sports like gymnastics and diving. The criterion helps to validate the judge's opinion and

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improves the objectivity. The administrative body that oversees the sport will develop a set of criteria to identify specific elements the performance must include to achieve a certain score.

Checklist 2.66

Develop measures to appraise performance. Which appraisal measures were most consistent, and why?

Figure 2.123 An official stands by to measure the distance of an athlete's long jump. This is an example of an objective performance measurement.

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Chapter summary

- The living human body is a complex machine, consisting of a number of interdependent body systems (such as the cardiovascular, digestive and muscular systems), carefully organised to produce an amazing holistic system characterised by balance, and the ability to sustain itself and produce vast amounts of mechanical and intelligent output. All of these functions require a constant source of energy or fuel to enable each cellular process.
- Three systems are used to resynthesise ATP. The initial system is the phosphocreatine system; the second system is anaerobic glycolysis; the third system is the aerobic energy system. The body's use of each energy system represents a complex interplay of fuel supplies, as each energy system seamlessly draws energy from all three systems to varying degrees.
- Utilising the aerobic energy system, an athlete's aerobic endurance levels are commonly developed using four traditional methods of training: continuous, fartlek, interval and circuit. Anaerobic training is used by athletes in non-endurance sports, and is effective for developing strength, speed and power. It is also used by body builders to build muscle mass.
- The four most commonly used methods of developing joint flexibility are static stretching, ballistic stretching, proprioceptive neuromuscular facilitation and dynamic stretching.
- Strength training comprises a variety of resistance exercises and methods that promote muscular contractions to build muscular size, strength and power. Strength training methods include free weights, weight machines, resistance bands and hydraulic machines.
- A unique feature of the sporting environment is the high degree of competitiveness and public exposure that exists, which most people do not have to deal with on a day-to-day basis. Highly motivated athletes train more intensely and are more driven to succeed when competing. There are two broad types of motivational factors: positive and negative. There are also two sources of motivation: intrinsic and extrinsic.
- Increased anxiety levels can be detrimental to the performance of athletes. Athletes need to learn to handle two categories of anxiety: trait and state anxiety.
- All sports require athletes to be in a certain mental state and condition prior to competing. This differs between sports, and athletes also present with individual differences in their mental state during the final moments prior to competing. Research has found that different tasks require different levels of arousal for optimal performance.
- Athletes must maintain their concentration and attention on relevant cues, and be able to ignore cues that are largely irrelevant. All sporting scenarios present a unique challenge to the athlete when it comes to maintaining the correct focus.
- Being able to control doubt, fear and anxiety while remaining centred and focused can provide the edge required for victory. Both real and fictitious images created in the mind can help athletes to achieve both these goals. Athletes can use their imagination and visual memory to improve performance. Two major types of imagery used are mental rehearsal and visualisation.
- Goals are important to help keep athletes accountable to a previously established expectation or standard, and the athlete may have several goals in place at any one time in relation to a range of lifestyle, training and performance factors.
- Recovery is the time required for the repair of damage to the body caused by training or competition, and is crucial to optimal sports performance for many reasons, some of which are physiological and some psychological. Recovery strategies comprise physiological, psychological, neurological and muscle damage strategies: cool-down, hydration, nutrition, long-term recovery, hydrotherapy, massage and foam rollers.
- The psychological benefits of sound recovery practices include increased motivation, a sense of well-being and the reduction of training and/or life stress. Examples of psychological recovery

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Chapter summary

methods include meditation, progressive muscle relaxation, mental imagery and visualisation, breathing exercises, floating for rest and relaxation, and music.

- The cognitive stage is the initial step in learning a new skill. It is essential the athlete gains an understanding of the skill and how it can be applied to their sport. The second stage of skill acquisition is referred to as the associative stage. This stage is characterised by less tuition from the coach and more practice from the athlete. The third and final stage of skill acquisition is the autonomous stage. As the name suggests, the athlete performs the skill automatically at this stage.
- Most skills are classified into one or more of the following categories: open or closed skills; gross motor or fine motor skills; discrete, serial or continuous skills; self-paced or externally paced skills.
- Feedback is a process by which information about a past or present event is provided. The information may come internally or externally, during or after the event, and/or as the result of a game. Feedback is very important as part of the learning process because it is feedback that helps to shape improvement and development.
- Close observation of an athlete who demonstrates not only proficiency but mastery of a skill will highlight key characteristics. The characteristics of a skilled performer include kinaesthetic sense, anticipation, consistency and technique.
- Measuring performance enables the coach and athlete to study and analyse their performance and that of an opponent more closely. Measurement normally involves gathering information and data. There are two styles of measurement: objective and subjective measurement.
- There are two recognised measures for judging: personal criteria or prescribed criteria. A personal criterion is judgement based on opinions, feeling and emotions about the performance. A more complex and objective way to make a judgement is to apply a prescribed criterion.

Multiple-choice questions

1 **The human body only has enough ATP to survive for how long?**

A 1 minute
B 30 seconds
C 10 seconds
D 5 seconds

2 **Which of the following is NOT one of the three distinct energy pathways or systems that are used to ensure the body is never depleted of its ATP stores?**

A anaerobic glycolysis
B aerobic energy system
C phosphocreatine system
D adenosine diphosphate

3 **Which of the following is NOT a characteristic of the aerobic system?**

A Lactate is a by-product of energy production.
B Carbohydrates and fat are its sources of fuel.
C The system can operate for 60 seconds-plus.
D Its cause of fatigue is depleted fuel sources.

4 **A trained athlete is more likely to have a resting heart rate closer to what?**

A 70 bpm
B 80 bpm
C 60 bpm
D 50 bpm

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Multiple-choice questions (continued)

5 **Which of the following is NOT a characteristic of fast-twitch muscle fibres?**

- **A** They are fatigue resistant at submaximal intensities.
- **B** Shot putters are suited to higher percentages of FT fibres.
- **C** They are often described as white muscle fibres.
- **D** ATP is metabolised at a faster rate than ST fibres.

6 **High levels of arousal are NOT suited for which of these sports?**

- **A** weightlifting
- **B** boxing
- **C** Rugby Union
- **D** shooting

7 **For the athlete, the pre-event meal should NOT be:**

- **A** low in carbohydrates
- **B** moderate in protein
- **C** low in fibre
- **D** low in fats

8 **Which of the following is NOT an indicator of over-training and under-recovering?**

- **A** decreased appetite
- **B** sleep disturbances
- **C** increased susceptibility to illnesses
- **D** positive changes in aerobic and anaerobic levels

9 **In order to replenish 1 litre of lost fluid, it is necessary to consume at least how many litres of fluid?**

- **A** 2 litres
- **B** 1 litre
- **C** 1.5 litres
- **D** 3 litres

10 **Which of the following foods does NOT have a high glycaemic index (GI)?**

- **A** white bread
- **B** pasta/noodles
- **C** rockmelon
- **D** raisins

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Exam-style questions

1 Analyse the energy systems used by a triathlete.
2 Identify a team sport and analyse the energy systems used.
3 Which type of training is best suited to marathon running and which training methods would be most appropriate?
4 Which type of training is best suited to weightlifting?
5 How does flexibility training affect performance?
6 Apply the principles of training to aerobic training.
7 Outline physiological adaptations in response to aerobic training.
8 Identify three physiological adaptations due to training, and examine how they would contribute to improved performance.
9 Describe the different types of motivation that can affect performance.
10 Explain the difference between anxiety and arousal in terms of sporting performance.
11 Compare psychological strategies that an archer and a netballer would employ to enhance motivation OR manage anxiety.
12 Compare the dietary requirements of a power athlete and an endurance athlete.
13 Analyse the use of protein as a supplement to improve performance.
14 Analyse the use of creatine as a supplement to improve performance.
15 Describe the range of recovery strategies used by athletes to improve performance.
16 Describe the stages of skill acquisition.
17 Outline the influence of heredity on skill acquisition.
18 Discuss the influence feedback has on the acquisition of skills.
19 Describe the learning environment that would best suit a cognitive learner.
20 Outline the characteristics of a skilled performer.
21 Why may a coach use objective and subjective performance measures to appraise the performance of an athlete?

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Chapter 3 The Health of Young People

HSC Option 1

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

- *what good health means for young people*
- *the extent of good health among Australia's young people*
- *the skills and actions required for young people to attain better health.*

Key terminology

autonomy
connectedness
health literacy
legislation
public policy
resilience
self-concept
self-esteem
self-identity
self-sufficiency
self-worth

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3.1 What good health means for young people

Driving questions 3.1

Reflect on the lifespan from childhood to adulthood.

1. **At what stages do people become more concerned about their health?**
2. **What are the reasons for these changing attitudes and priorities?**
3. **If a young person were to say they were healthy, what would this judgement be based upon? Could this perception be false?**

The nature of young people's lives

How the developmental stages can vary in motivations, values and socio-cultural background

It is often perceived that young people (those aged 12–24 years for the purpose of this chapter) are a very like-minded group who all have similar interests and face similar challenges. However, development and progression through adolescence can vary significantly between individuals, depending on a number of internal and external factors. The progression through adolescence sees individuals make the transition from child to adult, and experience a rapid physical, emotional, intellectual and social maturation.

As young people progress through adolescence, their ability to think, reason and make judgements develops. Recent studies have shown that brain development is not complete until the early twenties, with the area of the brain responsible for self-control and decision-making one of the last to develop. Young people begin to feel that they are the best ones to make decisions about their behaviours and future, and the natural response to others (such as teachers, parents and governments) trying to implement rules or make key decisions on their behalf is often rebellion. This is a key factor behind the high level of risk-taking behaviours exhibited by many young people, such as taking drugs, engaging in unprotected sex or dangerous driving. Over recent decades, social, technological

Physical changes during puberty

Boys

- Enlargement of the testes
- Penis gets longer and wider
- Hair grows on face, under the arms and around the groin
- Muscles develop
- Voice deepens
- Erections commence (ejaculation and wet dreams)
- Sperm production
- Acne

Girls

- Bodies become curvier and hip bones widen
- Hair grows under the arms and around the groin
- Breast development
- Weight gain
- Menstruation begins
- Acne

Figure 3.1 Adolescent boys

Figure 3.2 Adolescent girls

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and economic changes in Australian society have introduced new issues and opportunities for young people, which will be discussed throughout this chapter.

The influence of family/peers

Young people in Australia today are much more likely to be living in single-parent families, blended families and families where both parents work full time. The influence family has on the development of young people differs significantly. Some families allow adolescents a high degree of **autonomy** and freedom to experience new things, whereas other families may impose strict rules and responsibilities. Other examples of how family influences differ may be the approach towards adolescents' career choices. Depending on the situation, some families may encourage adolescents to leave school at the completion of Year 10 to work in the family business or contribute to the family financially, whereas others will place a higher value on education and encourage adolescents to pursue higher education through university.

autonomy independence and freedom to be able to make one's own decisions

As young people move through adolescence, communication between parents and young people often becomes a challenge. Parents instinctively want to know what adolescents are doing in their spare time and how they are progressing at school. Due to adolescents' increasing independence, many adolescents find this too intrusive, and feel that their parents are 'on their back'. This situation often results in poor communication between parents and adolescents.

Peer influence increases significantly through adolescence. This influence may be positive, such as support and friendship, and exerting good influence through encouraging sport and exercise, or negative, such as peer pressure to engage in risky behaviours or through bullying and/or social exclusion.

The influence of prevailing youth cultures

Youth cultural groups are often identified and distinguished by their clothing, appearance and musical tastes. Historically, many youth cultures have been portrayed negatively by the mass media. However, being involved in a particular youth culture often has very positive influences for adolescents, and can play a key role in their development and **self-esteem**.

self-esteem the level of respect and satisfaction people feel about themselves

The rapid development of the internet and social networking is exposing young people to a diverse range of cultures, and has facilitated new forms of communication that are replacing traditional face-to-face interaction. As a result, there are many more youth cultures in existence today, which places less pressure on young people to 'fit in' to any one particular cultural group. In previous generations, there were far fewer dominant youth cultures, such as hippies or surfers.

Figure 3.3 Surfing culture is a youth culture with a long history in Australia

Figure 3.4 Youth culture is heavily influenced by musical trends

The influence of global events and trends

In Australia today, access to information is almost instantaneous, due to our modern communication systems, and this can have both positive and

Going further 3.2

Inquire

Consider your family and peers. What influence have they had on your health?

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negative effects on young Australians. World news is often dominated by negative stories of war-torn countries and countries facing natural disasters and widespread food shortages, which may contribute to young Australians developing a pessimistic view of the world around them. From a positive point of view, young people now have unprecedented opportunities for travel, and to work and/or study overseas. There are now more opportunities for young people to become involved in world events without leaving the country, or to drive their own campaigns via social media. The Afghanistan war, same-sex marriage, climate change and the plight of many African nations are just some examples.

For many years now, social commentators have documented Australia following overseas trends – particularly from the United States and Europe. These include increases in popularity and participation among Australians of popular sports from these countries, such as basketball from America and soccer from Europe. Increased and more immediate exposure through the media, as well as increased travel, globalisation and migration patterns, are major drivers of these trends.

Other examples of overseas trends that have influenced Australia include the rave scene and the associated increased use of dangerous party drugs such as ecstasy, methamphetamines and ice.

The influence of technology

There has been a rapid growth in the development and application of technology in recent decades, and young people are now engaging with technology in ways that were not available to previous generations. There is widespread use of social media such as Facebook, Twitter, Instagram, Snapchat, Skype and blogging sites among young people, which has revolutionised the way they interact with each other and the world around them. The development of technology has presented new and exciting job opportunities, such as software development, marketing and web-page design, which are well suited to the skills of young Australians.

Figure 3.5 Many young people are rarely without their smartphones

While there are many positives associated with the increased use of technology, it also poses a number of issues for young people. These include:

- ease of access to inappropriate/explicit content, which may desensitise young people to violence
- encouraging risky behaviours, which young people may attempt after watching them online
- the cost of mobile phone plans and charges
- issues with cyber-bullying and cyber-safety
- increasing rates of sedentary time and drops in physical activity rates among young people
- development of injuries in the joints of the hands from excessive remote control use associated with gaming.

Checklist 3.4

What aspects of young people's lives make them similar to and different from the young people of previous generations?

Going further 3.3

Inquire

1 How can the developmental stage of a young person influence their life?
2 How can family and peers influence a young person's life?
3 How can prevailing youth cultures influence a young person's life?
4 How can global events influence a young person's life?
5 How can technology influence a young person's life?

Epidemiology of the health of young people

Patterns of morbidity and mortality

Mortality

Over the last two decades, death rates have halved among young Australians. However, rates among Indigenous young people and those living in remote and very remote areas are substantially higher than the national rate (3 and 2.6 times as high, respectively). In 2007, there were 1418 deaths

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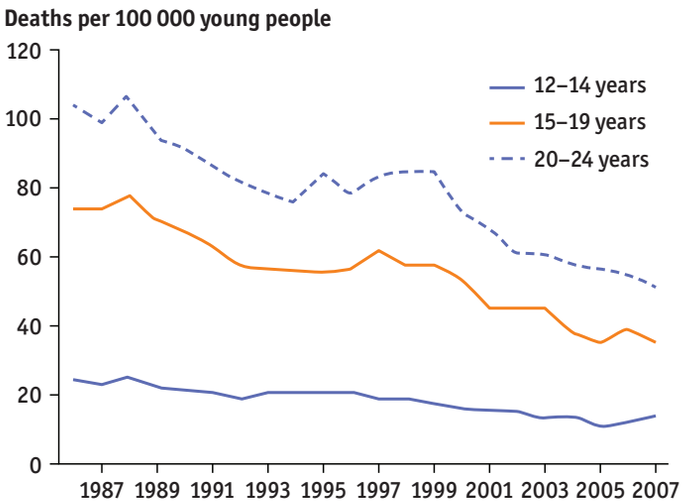
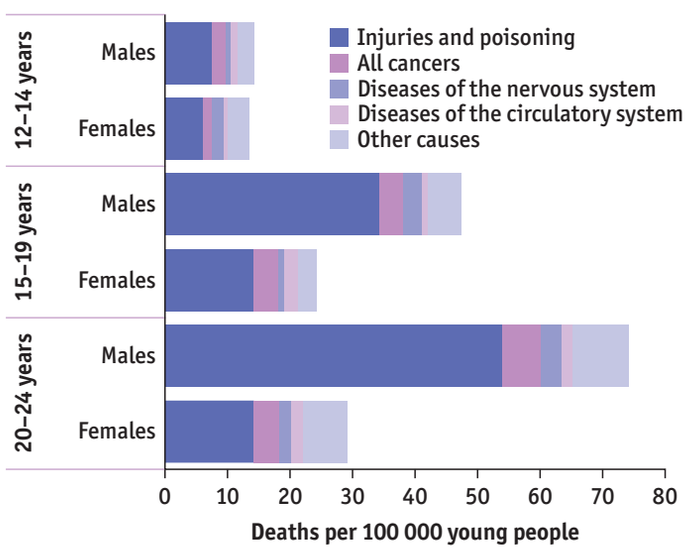


Source: AIHW National Mortality Database.

Figure 3.6 Death rates for young people aged 12–24 years, 1986–2007

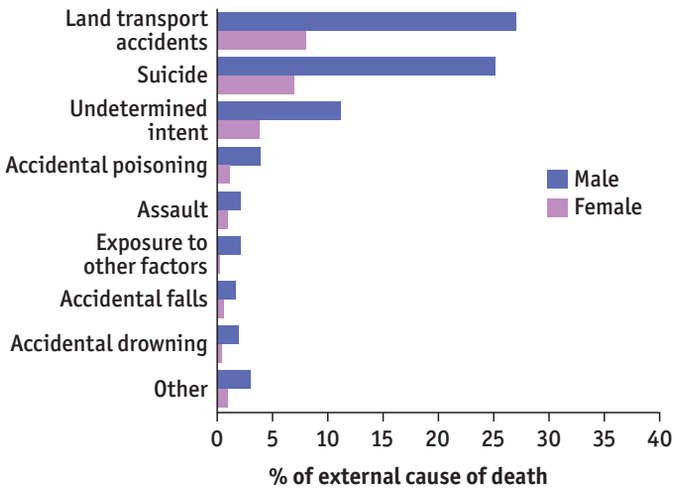


Note: Refer to Table A1.2 in *Appendix* 1 *Methods* for a list of ICD-10 codes.
Source: AIHW National Mortality Database.

Figure 3.7 Leading causes of death among young people aged 12–24 years, 2007

among young people aged 12–24 years – a rate of 37 per 100 000 (51 and 23 per 100 000 for males and females, respectively). Over half (55 per cent) of all deaths among young people occurred among 20–24-year-olds. Males accounted for over two-thirds (70 per cent) of all youth deaths.

Compared with older Australians, who experience significantly higher mortality rates from chronic diseases, the leading cause of death among young Australians is external causes. In 2007, the leading causes of death amongst 12–24-year-olds were injury and poisoning (66 per cent), cancer (10 per cent) and diseases of the nervous system. These causes accounted for 81 per cent of all deaths among young people.



Note: Refer to Table A1.2 in *Appendix* 1 *Methods* for a list of ICD-10 codes.
Source: AIHW National Mortality Database.

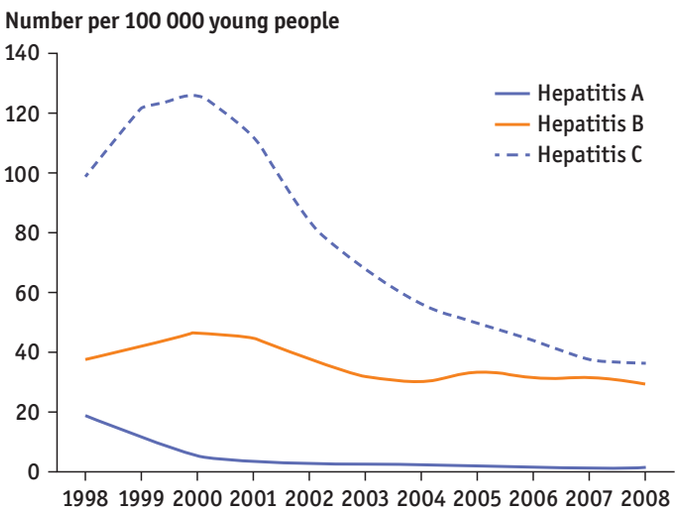
Figure 3.8 Injury and poisoning deaths among young people aged 15–24 years, by external cause of injury, 2007

Morbidity

Young Australians exhibit different morbidity rates, and from different causes, compared with the general population. Leading causes of morbidity among young Australians are mental health problems, injury and poisoning.

In 2007, 9 per cent of young Australians aged 16–24 years had high or very high levels of psychological distress, with one in four experiencing at least one mental disorder.

Females were twice as likely as males to report high or very high levels of psychological distress (13 and 6 per cent respectively). Among 18–24-year-



Note: Notification for hepatitis B and C are for newly diagnosed cases only, and include reports of 'newly acquired' or as 'greater than two years or unknown period of infection'.
Source: National Notifiable Diseases Surveillance System database unpublished data.

Figure 3.9 Notification of hepatitis A, B, and C among young people aged 12–24 years, 1998–2008

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olds, the prevalence of high or very high levels of psychological distress was similar to the rates in 1997 (7 and 13 per cent respectively for males and females in 1997 compared with 7 and 12 per cent in 2007).

The incidence rates for melanoma and asthma have been falling over recent decades; however, there has been an increase in the number of young people being diagnosed and treated for diabetes.

Communicable diseases, caused by infectious organisms, may result in significant illness and disability. Between 1998 and 2008, there were large increases in notification rates for sexually transmissible infections, particularly chlamydia. However, there were large declines in the notification rates for HIV, as well as hepatitis A, B and C, for which rates halved over this period.

Sexually transmitted infections (STIs) remain a major public health concern, contributing to significant long-term morbidity. In Australia, there are currently seven STIs of public health importance, other than HIV: chlamydia, gonorrhoea, syphilis, hepatitis B, trichomoniasis, herpes simplex virus and human papilloma virus.

Young Australians are at increased risk of contracting STIs due to:

- a lack of knowledge about STIs
- higher numbers of sexual partners than older Australians
- inconsistent condom use, or a lack of communication and negotiation skills that can make using condoms difficult
- immature reproductive and immune systems in adolescents, which may further increase risk.

The significant increase in the incidence of chlamydia is due to a combination of higher levels of unprotected sex among young people compared with other population groups, and significantly increased awareness and screening measures.

Comparisons of health status with that of other age groups

Going further 3.5

Inquire

Identify which health issues experienced by young people are showing:

- **a positive trend**
- **a negative trend**
- **no change.**

Young people experience good health in Australia compared with other age groups. see Tables 3.1 and 3.2.

Summary 3.6

1. What are the morbidity patterns for young people?
2. What are the mortality patterns for young people?
3. How does the health status of young Australians compare with that of other age groups?

Checklist 3.7

1. How positive is this health snapshot of young people?
2. How does the health of young people compare with that of other age groups?
3. What are the health issues with the greatest prevalence among young people?

The effects of the determinants of health on young people

Individual factors

Heredity

Each individual has a unique combination of genetic material passed on from their parents. Genetics may either protect individuals from disease or increase their risk. For example, familial hypercholesterolemia (a genetic condition in which the body produces too much cholesterol) increases the risk of cardiovascular disease. Many individuals may be genetically predisposed to a particular disease or health condition; however, it is often a combination of genetics, the individual's lifestyle choices and the environment that ultimately causes disease.

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Health status and well-being		Year of data	Value	Trend
Physical and mental well-being	Proportion of young people aged 15–24 years rating their health as 'excellent', 'very good' or 'good'(a) (b)	2007–08	93%	~
Disability and activity limitation	Proportion of young people aged 15–24 years with severe or profound core activity limitation	2009	7%	...
Deaths	Death rates for young people aged 12–24 years	2007	37 per 100 000	✓
Mental health	Proportion of young people aged 16–24 years having high or very high levels of psychological distress as measured by the Kessler 10 (K10) scale(a)(b)	2007	9%	~
	Prevalence of mental disorders among young people aged 16–24 years(a)(b)	2007	26%	...
Injury and poisoning	Injury and poisoning death rate for young people aged 12–24 years	2007	25 per 100 000	✓
	Road transport accident death rate for young people aged 12–24 years	2009	9 per 100 000	✓
	Assault death rate for young people aged 12–24 years	2007–08	1.3 per 100 000	✓
	Suicide rate for young people aged 15–24 years(a)	2007	10 per 100 000	P
	Accidental poisoning death rate for young people aged 12–24 years	2007	1.1 per 100 000	~
	Injury and poisoning hospitalisation rate for young people aged 12–24 years	2008–09	2199 per 100 000	X
Chronic conditions	Prevalence of long-term conditions among young people aged 12–24 years	2007–08	60%	✓
	Proportion of young people aged 12–24 years with asthma as a long-term condition	2007–08	11%	✓
	Incidence of diabetes among young people aged 15–24 years(b)	2007	31 per 100 000	X
	Incidence of cancer among young people aged 12–24 years	2007	26 per 100 000	~
Communicable diseases	Incidence of vaccine-preventable diseases among young people aged 12–24 years	2008	73 per 100 000	~
	Pertussis (whooping cough)	2008	64 per 100 000	~
	Hepatitis A, B and C notification rates for young people aged 12–24 years	2008	67 per 100 000	✓
	Hepatitis A	2008	1.8 per 100 000	✓
	Hepatitis B	2008	29 per 100 000	✓
	Hepatitis C	2008	36 per 100 000	✓
	HIV infection notification rate for young people aged 12–24 years	2008	3.1 per 100 000	X
	Incidence of notifiable sexually transmissible infections among young people aged 12–24 years	2008	1045 per 100 000	X
	Chlamydia	2008	945 per 100 000	X
Oral health	Proportion of young people aged 12 and 15 years decay-free(a)	2003–04	12 years 58%	X
			15 years 43%	~
	Mean number of decayed, missing or filled teeth (DMFT) at 12 and 15 years(a)	2003–04	12 years 1.03	~
			15 years 2.01	~

Table 3.1 Health status of young people

Key: ✓ = favourable trend; X = unfavourable trend; ~ = no change or no clear trend; ... = no trend data available or presented.
(a) Most appropriate age range for indicator.
(b) Source data not available for full age range.
Source: Young Australians – Their Health and Well-being 2011.

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	Males		Females		Sex ratio	
Age (years)	Number	Rate (a)	Number	Rate (a)	Death ratio (b)	Rate ratio (c)
Under 1 (d)	738	4.8	491	3.4	150	1.41
1–14	298	14.8	209	10.9	143	1.36
15–24	904	55.8	361	23.6	250	2.36
25–34	1 299	80.6	549	34.7	237	2.33
35–44	2 188	139.1	1 208	75.8	181	1.84
45–54	4 348	288.6	2 687	174.8	162	1.65
55–64	8 105	643.7	4 935	386.2	164	1.67
65–74	13 386	1 686.7	8 350	1 011.5	160	1.67
75–84	22 300	5 011.3	18 346	3 361.1	122	1.49
85 or over	19 911	14 427.6	32 846	12 627.6	61	1.14
All ages (a)	73 484	660.0	69 989	630.0	105	
Age-standardised rate (f)		680.0		470.0		1.45

Table 3.2 Deaths by age and sex, 2010

(a) Numbers of deaths per 100 000 population based on the estimated mid-year population for each age group.
(b) The number of male deaths that occur for every 100 female deaths, calculated by dividing male deaths by female deaths and then multiplying by 100.
(c) The ratio of the male death rate to the female death rate.
(d) The rate represents the infant mortality rate and is deaths of infants aged under 1 per 1000 live births.
(e) The sum of deaths at individual ages does not equal the total for all ages due to the confidentialisation process. The rate for all ages is the crude death rate.
(f) Rates are age-standardised to the Australian estimated resident population for 2001.

Source: Australia's Health 2012, p. 88.

Gender

Society places different pressures on young males and females. For young females, there is a strong desire to be slim and attractive due to images of women portrayed in the media. This leads to many young females developing disordered eating practices, and feeling anxious or depressed about their appearance. In recent years, body image has also become a significant issue for many males due to the social desire for masculinity, and has resulted in increased use of supplements marketed to increase muscle mass and steroid use among young males. Females are also more likely than males to seek advice and medical care when issues do present themselves.

Figure 3.10 Body image is a significant issue for both young women and men

Attitudes and behaviours

Attitudes of young people are shaped by parental/family and peer influences, experience and the values of wider society. Making decisions to avoid risky situations or engaging in risky behaviours has positive impacts on an individual's health. Unfortunately, many young people adopt the attitude that 'it will never happen to me', and engage in risky behaviours such as dangerous driving, illegal or legal substance use or unsafe sex. Young people are hugely influenced by their environment, so it is important that schools and parents of young people create supportive environments to facilitate healthy choices and behaviours. Parents need to act as role models and establish healthy environments through healthy eating and cooking, limiting 'junk food' in the house, engaging in regular physical activity and limiting the sedentary entertainment options available to young people.

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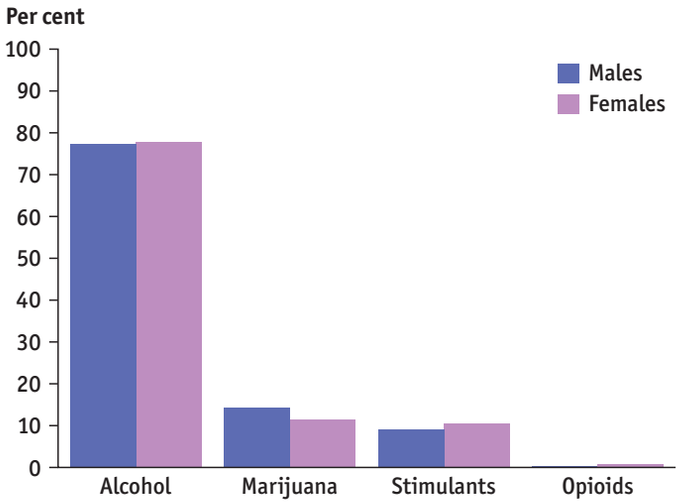

Source: AIHW analysis of ABS 2007 National Survey of Mental Health and Wellbeing.

Figure 3.11 Principal drug of concern for 16–24-year-olds with a substance use disorder, by sex, 2007

Substance use

Legal or illegal drug use can have both short- and long-term impacts on young people. Individuals who engage in drug use during adolescence are more likely to continue drug use later in life. Many adult tobacco or marijuana users started smoking during adolescence. During this period, many young people experiment with substances that may cause immediate or long-term health problems. Short-term problems include injury/hospitalisation from intoxication or misuse, dependence, withdrawal symptoms, psychotic disorders, poor concentration, engaging in risky behaviours and impacts on academic performance. In the long term, harmful drug use can cause a range of health problems, including blood-borne diseases, damage to the liver, heart and brain, and increased risk of cancer and other serious health conditions as well as severe impacts on socialising and maintaining healthy relationships.

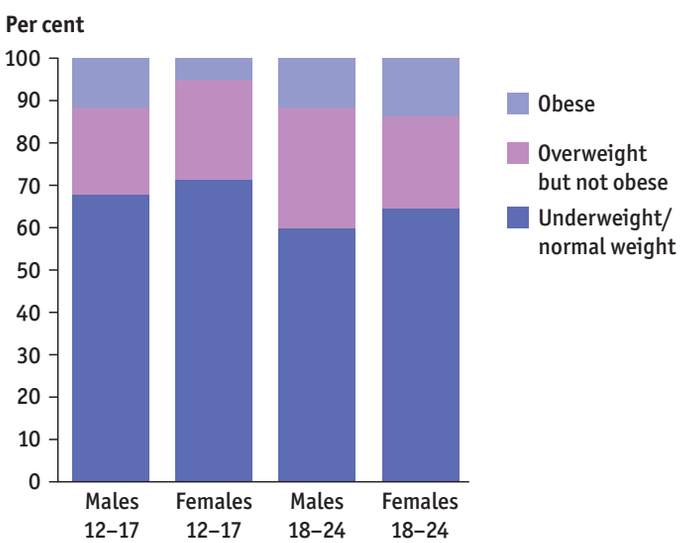

Figure 3.12 Young people aged 12–24 years by body mass index category, 2007–08

Overweight and obesity

In 2007–08, just over one-third (35 per cent) of young Australians were estimated to be overweight or obese – 23.3 per cent overweight but not obese, and 11.3 per cent obese.

This is a trend that is sharply rising, as the rates in 2004–05 were 25 per cent for overweight and obesity among young people. Key contributing factors behind the rise in overweight and obesity among young people are declining intakes of fruits and vegetables, increasing consumption of sugary drinks and energy drinks, and inadequate amounts of physical activity.

Regular physical activity and healthy eating are paramount for maintaining good health and reducing the risk of overweight or obesity, high blood pressure, cardiovascular disease, type 2 diabetes and many cancers, as well as improving the psycho-social well-being of young people. Obesity in young people has been linked to social isolation, lower educational achievement and lower income levels throughout life.

Nutrition

Recent surveys of the nutritional habits of young people have found a number of problematic issues, including not meeting the recommended intakes for key food groups such as vegetables/legumes, fruit and dairy, skipping meals (particularly breakfast) and disordered eating habits. When these findings are combined with increased rates of sugary drinks (soft drinks and energy drinks) and snack food consumption among young Australians, as well as falling rates of physical activity, it is not surprising that overweight and obesity rates are increasing. There are many contributing factors behind these trends, including:

- increases in the amount of food young people are buying and consuming outside of the home environment (buying food from shops, takeaway outlets and canteens)
- increased availability and choice of snack foods and sugary drinks
- marketing and advertising of soft drinks and junk food targeted at adolescents
- soft-drink and food companies sponsoring events such as music festivals and sporting events, which are popular with young Australians
- a lack of food-preparation skills and nutrition knowledge

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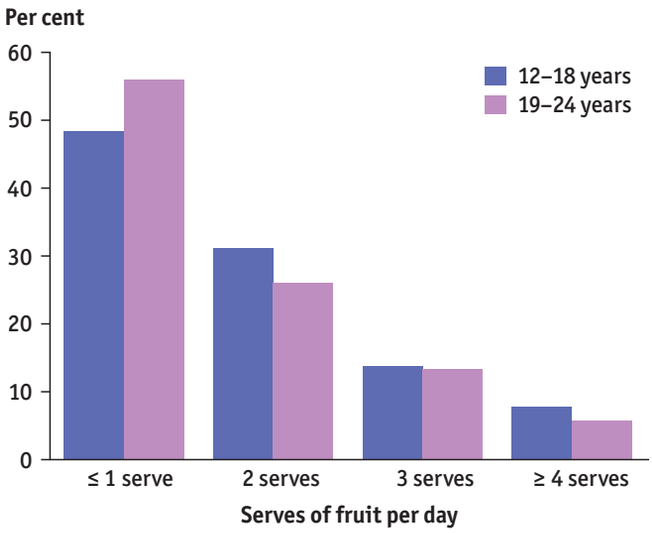
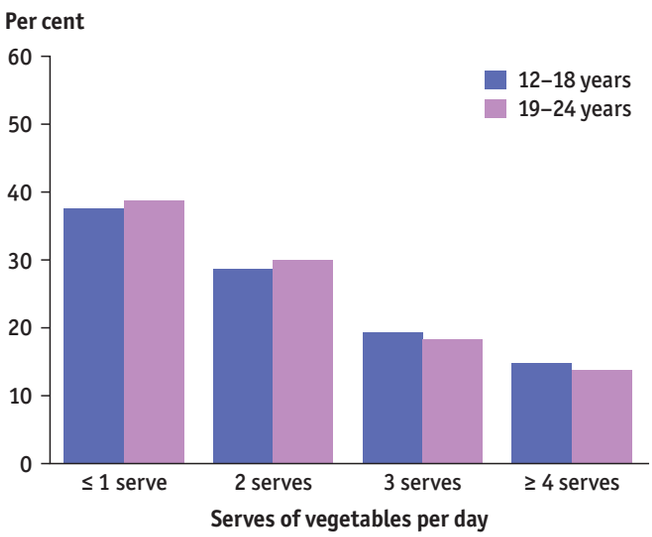




Notes:
1 A particular number of serves means that at least that number and up to the next number of serves was consumed, e.g. two serves means that at least two and up to three serves were consumed.
2 Data excludes those who did not report eating fruit (6% of young people) or vegetables (1% of young people).

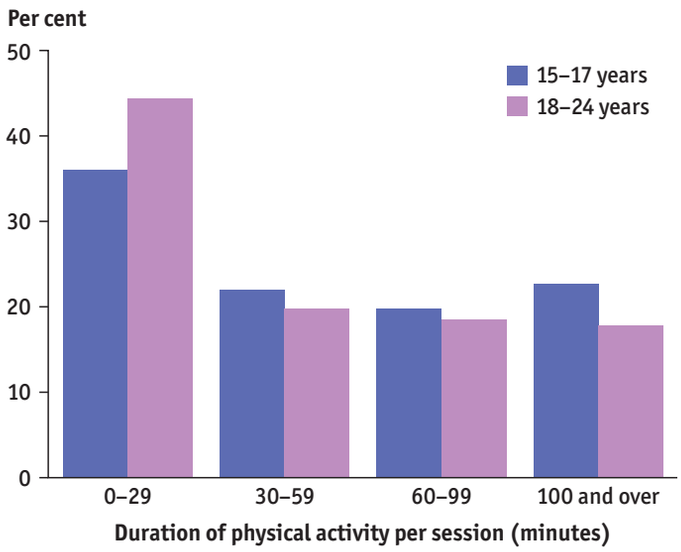
Source: AIHW analysis of the ABS 2007–08 National Health Survey confidentialised unit record file.

Figure 3.13 Usual daily consumption of fruit and vegetables among young people aged 12–24 years, 2007–08

- both parents commonly being in full-time work, which increases reliance on takeaway and convenience meals within the household
- young people often perceiving healthy foods to be more expensive
- fresh produce (vegetables and fruits) costing more in rural/remote areas.

Physical activity

In 2007–08, among young people aged 15–24 years, four in ten young people (44 per cent) met the physical activity guidelines; however, rates were substantially lower for those living in outer regional and remote areas combined (34 per cent) and Indigenous young people (14 per cent in 2004–05). More than one in four young people (27 per cent) were sedentary (no exercise or very low levels of physical activity), which is a concern as evidence suggests that children who are sedentary and engage in more than two hours of non-educational screen time per day are more likely to be overweight and less physically active, consume more sugary drinks, snack on foods high in sugar, salt and fat, and have fewer social interactions. Physical activity reduces cardiovascular risk factors, protects against some cancers and strengthens the musculoskeletal system. It also improves well-being by reducing symptoms of depression, stress and anxiety.



Note: Denominator is all young people of the relevant age group.
Source: AIHW analysis of the ABS 2007–08 National Health Survey confidentialised unit record file.

Figure 3.14 Young people aged 15–24 years who participated by physical activity within the last week, 2007–08

Sun protection

Exposure to sunlight in childhood and adolescence is the main risk factor for melanoma. This risk is reduced through the adoption of skin cancer-prevention measures – using sunscreen, covering up and wearing a hat.

Sexual and reproductive health

Sexual development is a normal part of adolescence. Effective contraception use is paramount in lowering the rate of unwanted pregnancies and the prevalence of STIs. Teenage motherhood can pose long-term risks to both mother and child. Teenage parenthood often means interrupted schooling, a high risk of single parenthood, greater dependence upon government

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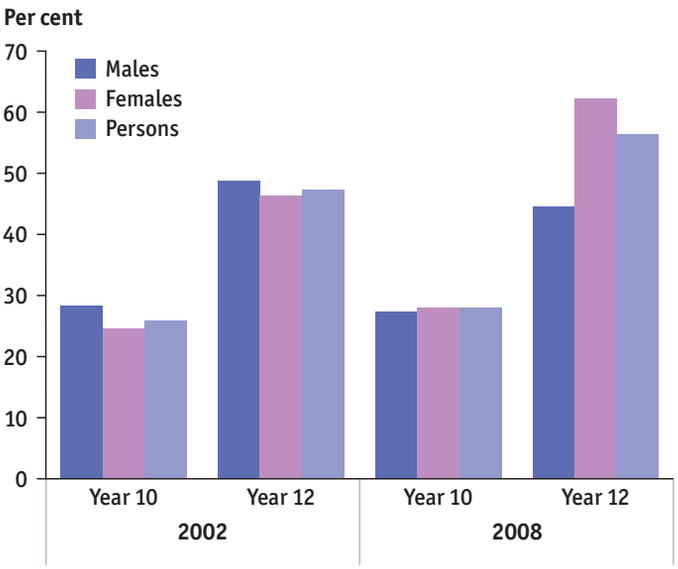

Source: Smith et al. (2009).

Figure 3.15 Students in Year 10 and Year 12 who have ever had sexual intercourse, 2002 and 2008

assistance, problems with securing employment and entrenched poverty.

Sleep

Sleep disorders and sleep deprivation have an impact on the health of young people by reducing their capacity to undertake normal everyday activities. A lack of sufficient sleep can result in poorer school grades and a higher rate of traffic accidents.

Socio-cultural factors

Family

There are many benefits for young people of living in a strong and stable family. This includes having positive role models in terms of relationships and generally higher self-esteem. The opposite is often true for those living in dysfunctional families.

Parents' health can also be a significant factor. A parent is normally the primary carer, and as a result is responsible for the physical, emotional and economic needs of the child. When disruption occurs, the needs of the young person may not be met.

Parents with a disability can impact on the young people's development. The young person may also be placed in a position where they must care for their parent, resulting in restricted education and social activities, and even increased stress.

Social capital

Social capital means the networks that support young people. Having good social capital results in positive mental health, and leads to fewer school dropouts and the potential to gain meaningful employment. Strong family relationships and supportive communities are essential for good social capital.

Community participation

Involvement in the community enriches both the community and the individual. It provides a sense of belonging. Examples include volunteering, socialising and involvement in group recreational pursuits.

Being enrolled to vote is an indicator of a young person's **connectedness** to their community. It strengthens social networks, but also allows the individual to feel they are a part of their community.

connectedness the number and quality of social connections or relationships with family, friends and acquaintances

School relationships

Positive school relationships – relationships with the school itself and a young person's peers – are associated with better educational and social outcomes. Bullying and other negative school influences often lead to lower academic achievement, increased absenteeism, anxiety, depression and alcohol and substance abuse.

Child abuse

This can include neglect, physical abuse, sexual abuse and emotional or psychological abuse. Abused young people often have poor social and health outcomes. This can include poor school performance, increased likelihood of committing a crime and mental health issues.

Homelessness

Homeless people experience adverse social and health consequences, including mental health problems, disrupted schooling and increased chance of assault, poor nutrition and inadequate housing. These young people are also more likely to engage in risky behaviours.

Ethnicity and cultural background

The multicultural nature of modern Australia is beneficial for the health of young people. It teaches young people not to discriminate, and promotes tolerance, acceptance and understanding of other cultures.

Immigrants and those born overseas are at risk of a range of mental health issues. As they move to new countries, they are faced with adopting and

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fitting into a completely new culture, and often facing language and communication barriers. Making this even more difficult is the fact that support networks of extended family and friends are broken when they move. These factors place young migrants at risk of depression, low self-esteem, anxiety and social isolation.

Within the different cultures, there are particular customs and values that are passed on to future generations, such as caring for elders and/or younger siblings. Many young people today are branching away from the traditional aspects of some cultures, such as pre-arranged marriage, and choosing partners from outside of their cultural group.

For some young people, losing touch with relatives and their culture can have a significant impact on their mental health, and may lead to depression.

Aboriginality

Young Indigenous Australians exhibit poorer health characteristics than the rest of the Australian population. Indigenous Australians tend to have lower socio-economic status and lower levels of education, are more likely to use alcohol at risky levels, and have poor nutritional habits and higher rates of smoking. As a result of these characteristics, young Indigenous Australians – especially those in remote regions – are often raised in an environment that isn't supportive for establishing healthy behaviours. As well as these physical health issues, young Indigenous Australians are also faced with a range of social issues, including higher rates of unemployment, racism, inadequate housing and low self-esteem, due to not having a connection with their culture.

In remote areas, drug- and alcohol-related health issues and violence are issues commonly faced by young Australians, and contribute to increased rates of suicide, motor vehicle accidents and both physical and verbal abuse. Indigenous people experience high rates of imprisonment and problems with authority figures. In recent years, governments and Indigenous community leaders have been implementing a range of programs aimed at reconnecting young Indigenous Australians with their traditional culture, with the aim of reducing crime, improving health and improving self-esteem.

Socio-economic factors

Socio-economic status

Many young people share the same level of economic advantage or disadvantage as their parents. Many young people are still dependent on their families for financial support. For those who are able to earn an income, it is typically only part-time work while still at school.

Young people from low socio-economic backgrounds are more likely to smoke, drink alcohol in risky amounts and have a poorer diet. Therefore, low socio-economic status represents a significant risk factor for health, particularly for lifestyle-related chronic diseases. People from low socio-economic backgrounds also display lower rates of utilisation of health services, have poorer housing and tend to work in less-skilled and less-rewarding jobs, which over time can negatively affect mental health and feelings of self-worth.

Employment

Over recent decades, there has been a strong trend towards less full-time employment and more part-time, casual and contract work. In addition to changes in the type of employment, new jobs are not being created at the same rate, which is making it very competitive for young people to find employment in today's society.

Australia is facing increasing rates of youth unemployment, which is placing huge financial pressure on government welfare payments, and also means increased financial pressures on the families of young Australians looking for work. There are typically even fewer employment opportunities for young people in rural and remote areas.

Employment has a number of benefits for young people, including financial independence, improved self-confidence and feelings of self-worth due to being valued by their employer, colleagues and the wider community. However, the opposite effects can also occur in young people who struggle to find consistent employment and become reliant on government payments. These individuals are often referred to disparagingly as 'dole bludgers'.

Many young people who do secure work do so in unskilled, part-time roles such as in takeaway food outlets, other hospitality industry jobs and basic machinery operating jobs. For these jobs, many young people are required to work outside of school hours (weekends and nights), which impacts on study and social commitments, and may introduce new risks associated with fatigue. Many young people who leave school enter into structured apprenticeships and traineeships, where the initial level of pay is quite low, with the amount increasing annually with experience.

Education

Education is integral to a young person's health and well-being, as well as their future productivity and contribution to society. There has been a positive

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trend in education over the last 50 years, with significantly more young people staying longer at school and in higher education.

Retention rates (students staying to the completion of Year 12) have increased from 23 per cent in the late 1960s to 76 per cent in 2009. Retention rates have been fairly stable since the early 2000s.

In 2007, over half (57 per cent) of all 15–24-year-olds were studying for a qualification; however, rates were substantially lower among Indigenous students and those living in remote areas. Studies have highlighted that nearly one-third of school leavers aged 15–24 years did not complete Year 12, and those who left school without completing Year 10 were twice as likely to be unemployed than those who completed Year 12 (25 per cent compared with 12 per cent). To address this issue, the Council of Australian Governments (COAG) introduced a youth participation requirement from 1 January 2010, requiring young people to be in school until they complete Year 10 and then to participate in full-time education, training or employment until they turn 17.

School education now has an even bigger role to play in shaping values and health behaviours among young Australians, as they are staying at school for longer. It is important that schools provide health education in areas such as drug use, sun protection, healthy eating and physical activity, as well as creating supportive environments for these areas by having good policies. Examples include healthy canteens, daily physical activity circuits and 'no hat, no play'.

Environmental factors

Geographic location

Young people who live in rural and remote regions suffer worse health than those who live in cities. Lower rates of employment, education and income force young people to move to metropolitan areas. This can expose them to ongoing issues, related to social isolation, poor living conditions and exposure to physical and mental harm. Young people who live and work in rural and remote communities tend to drink more alcohol, and are exposed to dangerous work and living environments. There are also strong cultural stereotypes that discourage young men from employing preventative health measures, such as regular health check-ups. This is further compounded by the lack of access to both basic and specialised medical services in these areas.

- **Access:** Decreased access to medical services can result from a variety of factors, which can influence a young person's ability to maintain good health.
- **Distance:** Having further to travel to access basic medical services means that young people in rural and remote regions are less likely to attend to basic health needs.
- **Language:** If English is a second language in the home, young people face difficulties in clearly communicating their health needs.
- **Finances:** Less disposable income decreases the likelihood that young people will employ preventative health measures.
- **Education:** A lack of awareness and knowledge of the signs and symptoms of ill-health, as well as the skills to access appropriate health services, leave young people exposed to poor health.
- **Technology:** Can be both potentially beneficial and harmful in relation to supporting good health. Social media sites can promote good social connections, and good health information is easily accessed via the internet. However, negative images can be promoted through the media, which can promote poor health behaviours, such as controlled dieting to maintain a certain body image. Young people must be aware of misleading information and messages, which is where both technology and **health literacy** can be preventative factors.

health literacy the ability to access, read and interpret health-based information, and to then make an informed and relevant decision that supports and promotes good personal health

Summary 3.8

1 Outline the individual factors that affect the health of young people.
2 Outline the socio-cultural factors that affect the health of young people.
3 Outline the socio-economic factors that affect the health of young people.
4 Outline the environmental factors that affect the health of young people.

Checklist 3.9

1 How may various determinants of health adversely affect the health of young people?
2 Propose strategies to overcome these factors.

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Figure 3.16 Navigating through childhood to adulthood is complex and sometimes tumultuous

Developmental aspects that affect the health of young people

As young people grow and develop through the complex and sometimes tumultuous period of childhood to adulthood, they must navigate their way through a range of major changes and personal challenges. Similar to a yacht navigating its way through difficult weather conditions, a young person who is equipped and able to maintain their life direction towards personal success and well-being should be better prepared to manage these changes well. Ultimately, this should enable a young person to enter adulthood with a positive sense of self-confidence and mental well-being. This will have many positive health benefits, both immediately and into the rest of the young person's life.

In contrast, where a young person's developmental years are characterised by poor life and health choices, with a lack of ambition, education, personal growth and maturity, they will often have to live with a range of ongoing negative personal, social and relational consequences. A good analogy for this is the idea of 'someone carrying baggage throughout their life'. By navigating these developmental years poorly, a young person can sabotage their future success, health and well-being, often unaware of the impact their current choices will have into the future.

Helping young people reach adulthood with this strong foundation requires the invaluable input of a range of different voices and influences. These could include parents, teachers, other significant adults and peers. In today's complex world, strong messages from positive sources are important in helping young people to distinguish against potentially negative influences such as peers, the media and damaging socio-cultural messages that encourage poor decision-making.

Some of the important developmental and behavioural milestones and characteristics that young people require to enter adulthood successfully are outlined below.

Revising roles within relationships

During infancy and childhood, the modelling of relationships to which a young person is exposed is critical for helping them see the proper ways in which a person should conduct themselves in relationships. Watching a family that loves and respects each other, as well as those from outside of the family – regardless of social position – is

Figure 3.17 Family relationships provide the first model for young people on how they should behave in relationships

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critical for helping young people start to develop their own relationships as they mature. One very important aspect here is in the skills of conflict resolution. Growing up in a family with poor conflict-resolution skills – particularly one that is abusive – will often repeat itself in the next generation.

All relationships have the potential to be personally beneficial and meaningful, or abusive and damaging. All individuals in relationships have rights and responsibilities to ensure that they remain positive, regardless of the position and status of each. Where a power imbalance does exist – for example, between a boss and an employee – this is even more important. As young people become more independent, they take increasing responsibility for ensuring their relationships stay healthy.

Personal relationships have a range of characteristics that make them unique and meaningful. However, recognising these differences, and adopting roles and behaviours that foster and respect them, is essential if young people are to form a range of positive and beneficial relationships with different people. These different roles and responsibilities depend on the nature of the relationship. Is there an equal power balance? Or is one person more dominant or submissive due to social position (e.g. between a teacher and student). In all circumstances, adopting appropriate roles within all relationships is essential.

Relationships also have the potential to change rapidly, whether it is through breakdown and separation or through forming new relationships. Consider the life of a 14-year-old with two younger siblings, growing up with a single mum who then starts a serious relationship with another man who has his own children. This newly blended family presents a range of sudden relational changes that can be challenging. Likewise, when a 16-year-old starts their first job, they must quickly form appropriate and positive relationships with colleagues and supervisors, which are unique in their social expectations and norms. Impending parenthood is another example, where a young person may have to quickly discover their expected roles and responsibilities in a new relationship.

Figure 3.18 Every human relationship is unique and meaningful in its own way

Going further 3.10

Inquire

1. Based on the two images below, identify unique features of each relationship.
2. What are the features that are different, and that make them stand apart from the others?
3. Is it an equal relationship, or is one person more dominant or submissive than the other?
4. What are the specific roles that each person may have in the relationship that make it unique?

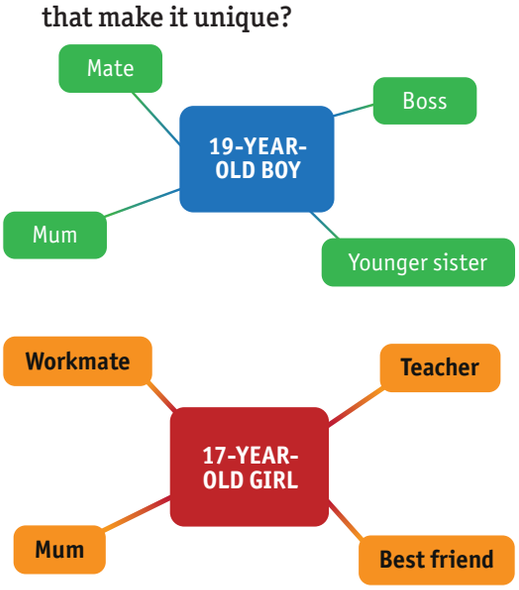

Figure 3.19 The way a person perceives themselves in the mirror, and the value and self-acceptance they feel, are very important for development

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resilience the ability to 'bounce back', recover and respond positively to challenging, stressful and traumatic situations

Skills of **resilience**, self-confidence and maturity will enable young people to adapt to new roles in relationships.

Clarifying self-identity and self-worth

From a young age, all people share a common experience as they seek to establish their own sense of identity. They often express this in the clothes that they choose to wear, the activities in which they participate and the music to which they listen. Adolescence is the life stage where people are most concerned with their appearance and what other people may think of them. They often feel as though the whole world is looking at them, judging and waiting for the them to make a mistake.

self-identity recognition, awareness and acceptance of the qualities and characteristics that make an individual feel unique

However, **self-identity** goes much deeper than just media and clothing preferences. Understanding and recognising one's own unique personality characteristics, personal strengths and shortcomings, interests, personal background and sense of place in the world are critical for helping an individual to develop a strong sense of identity. Just as important as knowing this information is appreciating and accepting one's own self, and having a healthy sense of pride in oneself. Young people who feel ashamed of who they really are in public risk mental distress and inner conflict.

self-worth a person's inner belief in their own value and place in the world, and that they are worthy of esteem and respect from others

Even more valuable than self-identity, however, is the concept of **self-worth**. Truly believing in one's own value and place in the world provides great confidence and self-assuredness, especially during times of difficulty. In this manner, a strong sense of self-worth can act as a protective factor when a person's value and worth are challenged. For example, a teenager who is bullied will find great resilience in a strong inner belief in their own sense of identity and worth.

Figure 3.20 Learning to drive is an important step towards independence for many young people

Supportive parenting and family life, as well as good experiences at school, are important for helping young people to establish and clarify their own self-identity and self-worth. This can be supported by regularly hearing positive messages of affirmation, as well as growing up in a safe social environment, where you feel safe to be yourself.

This developmental aspect is fundamental to helping young people feel good about themselves, and to have an inner strength and confidence. In turn, this has a great impact on a young person's mental health, and is a protective factor against such things as depression, eating disorders and anxiety.

Developing self-sufficiency and autonomy

A strong sense of self-identity and self-worth naturally leads to young people feeling confident in themselves and their ability to be successful in the future. Positive life experiences and

Figure 3.21 A young person's first job can be a critical aspect of developing a sense of identity

Going further 3.11

Inquire

Reflect on a time where you felt unsure about yourself, and you kept something hidden from other people. What were your reasons for doing this? Was it more to do with yourself or other people? If you could say something to yourself to overcome this, what would it be?

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self-sufficiency ability to survive and provide for your own needs without the help of others

a supportive upbringing should promote a successful transition towards independence and **self-sufficiency**. This is a staged process, and dependency upon parents and others is slowly removed. For example, choosing what to wear is a common sign of a child asserting their own desire to be an individual; however, being able to make wise decisions with money does not occur until closer to adulthood. Increasing independence also brings greater responsibility. Ultimately, a young person will become responsible for their own time, money, relationships and health. Being able to wisely make decisions in each of these areas is critical for a young person to be able to have a successful and happy future.

Therefore, as young people transition towards adulthood, they should be able to provide for themselves, and be able to make mature and wise decisions. Often it is through life experiences that young people learn valuable lessons that will affect their future behaviours. Hopefully, any negative consequences from poor decision-making do not have long-term and ongoing ramifications – for example, dangerous driving leading to permanent disability. As young people have new life experiences, such as travel, new relationships,

Figure 3.22 The transition into adulthood can be a complicated one for young people

Going further 3.12

Communicate

Share with another person the most impactful experience of your life, which led to increased responsibility and independence (i.e. self-sufficiency and autonomy).

Figure 3.23 Adolescence is the time when we set goals for our future careers

and senior studies and starting employment, they start to develop a confidence in their own ability to be independent and autonomous. This is a highly rewarding position to be in, and it is vital to good mental health.

Establishing education, training and employment pathways

Perhaps one of the most challenging developmental aspects of adolescence is the pathway towards finding productive and meaningful employment. There is much for a person to learn about themselves and their own unique skills, strengths and interests before they can even start to dream about a desired career. The part-time jobs that many young people have while at school are not the careers they will have in the future. These provide positive life experiences about the world of work, as well as some extra money. Recognising the importance of a strong career, and setting goals that affect lifestyle decisions in helping reach this goal, are key steps in the growing independence of young people.

Formal schooling provides a basic foundation upon which young people can build. Senior studies in Years 11 and 12 provide the first opportunity

Figure 3.24 What you study in secondary school will help you decide your interests, strengths and weaknesses

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for real choice in education. Often these subject selections are made based upon strengths and interests, with some degree of consideration towards future career pathways. For example, doing a vocational course provides real experience of and training for what the world of work may be like – for example, a Certificate 2 in Hospitality or Construction. However, after a young person leaves school, decisions regarding future education, training and employment pathways take on much greater significance. Options such as further TAFE or university-based study, an apprenticeship or finding full-time employment become essential if young people are to maintain a self-sufficient and personally rewarding lifestyle.

Young people who either do not finish school, or are unable to find a permanent position in either work or an apprenticeship, are at great risk of poor health outcomes. The risk of mental health disorders such as depression is higher among young people who are unemployed. Feelings of

Figure 3.25 Helping others can provide a sense of purpose in life

worthlessness and a lack of purpose in life can lead young people towards other poor health decisions. For example, drug use, alcohol abuse, risk-taking, smoking, and poor diet and activity levels are all higher in young people who did not finish school and are unable to find work.

Statistically, young people today will have a number of career changes throughout their lives. This is very different from those in past generations, who tended to stay in the same career all their lives. Therefore, young people must develop the skills required to be lifelong learners, capable of learning new skill sets and accessing information to support a successful career change. As young people finish school, it is important for them to set some goals and establish a career pathway that will provide direction and purpose in life.

Figure 3.26 Friends provide a support structure

Establishing personal support structures

All people experience life events that can be challenging, stressful and perhaps traumatic. This can be even more difficult for young people, as they may not have reached a level of emotional maturity and independence sufficient for them to be able to handle these situations as well as an adult. However, no matter what their age, all people need to have personal support structures in place to help them work through these difficult situations, providing emotional support, guidance and counselling.

Most young people draw this primary support from their family, and this will continue well into adulthood. However, as young people mature, they may need to develop and access new support structures. For example, a young person who has moved away from home to study will not always be able to call upon immediate family for help and support. Establishing these structures is essential in supporting the health of young people at times of trauma and challenge.

It is important that young people seek appropriate support during difficult times. Close friends may not be the best choice for a teenager during very emotionally challenging times. Young people who live without these support structures are at great risk of

Figure 3.27 Young people without a support structure may make bad choices

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Going further 3.13

Inquire

For each of the following significant personal support structures, write down the types of support they are most likely to provide:

- parents
- other highly trusted adults
- siblings and close friends
- school-based career counsellors, psychologists and teachers
- online and telephone support services – for example, Kids Helpline
- employers and supervisors
- doctors.

mental distress during such challenging times, and it is important that professional support services are accessed if personal relationships are not providing the necessary support. Organisations and initiatives such as beyondblue and Reach Out work hard at providing such support services for all young people.

Determining behavioural boundaries

Learning right behaviour from wrong starts from infancy. Things like sharing, respect, saying thankyou, please and sorry, not hitting or using physical actions to express frustration are some of the basic behaviours that are taught to young children. These are foundational during childhood and into adolescence to help young people learn to behave in an appropriate way at school, home and in public places. Increasing freedom and independence can also bring new temptations that can carry a range of potentially negative outcomes.

Negative consequences are often used to guide behavioural decisions. For example, being grounded or having a phone removed could be the punishment for breaking a time curfew at home. Detention is a common punishment during school. The consequences for breaking society's laws are often very severe, from heavy fines to incarceration in juvenile justice or jail. The degree to which a young person obeys such laws and expectations is often a significant factor in ensuring they behave in a way that does not compromise their health or future. Young people who are constantly in trouble at school or with the law have difficulty finding success and establishing stability in their day-to-day lives.

Figure 3.28 Mobile phone use while driving is a high-risk behaviour that carries both health and legal consequences

Research 3.14

Collaborate

In small groups, analyse each developmental aspect of the syllabus and rank the degree to which it could potentially affect the health of young people. Consider both short- and long-term health outcomes, as well as all dimensions of holistic health.

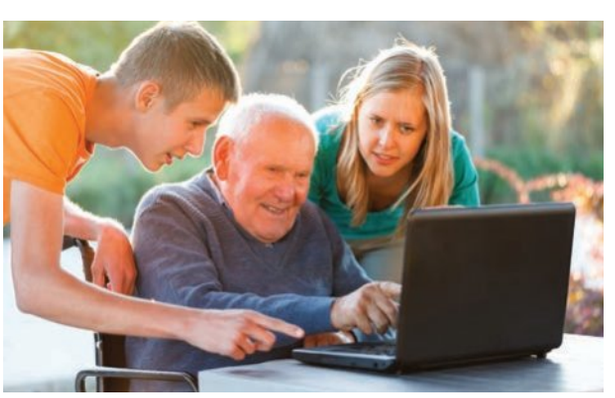

Figure 3.29 Responsible young people feel a sense of purpose and direction

However, even more challenging than this is the determination of appropriate behaviours in relation to lifestyle, relationships and health. These may carry less risk of legal consequences, but the emotional and social ramifications can be equally damaging. Excessive binge drinking, poor diet and activity levels, risk-taking, risky sexual behaviours

Summary 3.15

Outline the developmental aspects that affect the health of young people.

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Checklist 3.16

1 Identify the relationship between successfully managing these developmental aspects and health.
2 Is health a priority for young people?
3 What would young people view as the indicators of good health?

and irresponsible use of social media can all lead to physical, mental and emotional consequences and permanent scarring.

Young people who are responsible, feel a sense of purpose and direction in their life, have supportive friends of a similar maturity level and have a healthy respect for the negative consequences of their behaviours will be most likely to have a happy and healthy life. Determining these personal behavioural boundaries requires the positive input of supportive parents, teachers and peers.

Figure 3.30 A supportive environment at home can help young people have happy and healthy lives

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3.2 The extent of good health among Australia's young people

The major health issues that impact on young people

Driving questions 3.17

1 How would you describe the health of young people compared to other age groups?
2 What are the health issues of most concern?
3 Why do you think they are so prevalent?

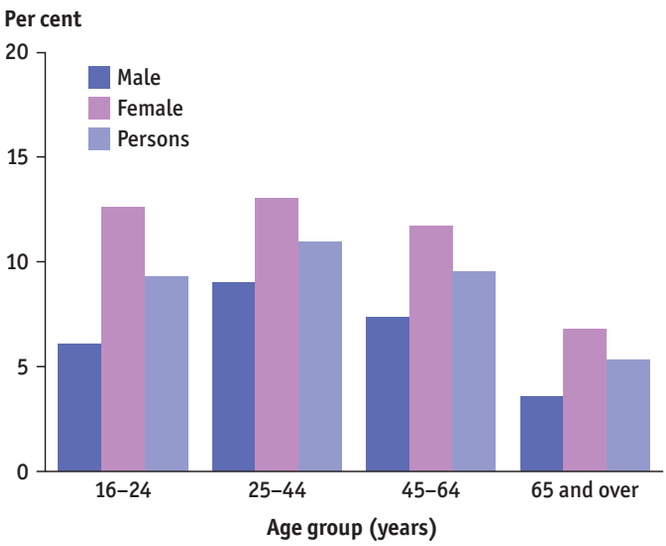
Mental health problems and illnesses

Young people experience increased daily stress – for example, family breakdown, feelings of worthlessness and loneliness, and limited career opportunities. However, they often do not have the necessary coping skills to self-manage either high levels or long-term sources of stress. Major issues are depression, anxiety and substance abuse. Often sufferers have more than one of these illnesses, compounding the effect it has on the person. Approximately one in four young people will have experienced clinical depression by the age of 18, and trauma, grief and loss – for example, from parental divorce, death and moving schools – are very significant issues. Self-harm and self-mutilation are increasingly common, particularly among victims of abuse, and an estimated one in ten young people will attempt suicide, often as a means of escape or to seek attention. Similar rates of young people suffer from substance abuse disorders, with the most common being alcohol related.

Nature and extent

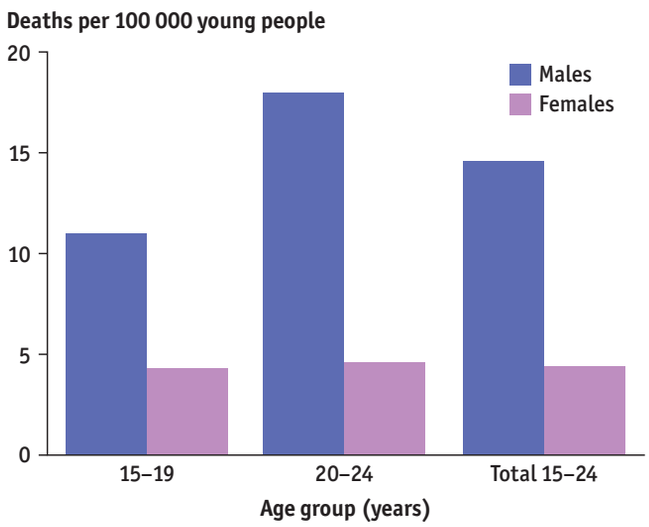
In 2007, among young people aged 16–24 years:

- Nine per cent had high to very high levels of psychological distress.
- Females were twice as likely to report these levels of distress (13 per cent females compared with 6 per cent males). These rates have remained stable over the past decade.
- High levels of distress were higher in those diagnosed with a mental disorder (21 per cent), compared with those reporting no mental disorder (4 per cent).
- An estimated one in four young people (26 per cent) had experienced at least one mental disorder in the past 12 months.
- Females (30 per cent) were more likely than males (23 per cent) to have experienced mental disorders.



Source: AIHW analysis of the 2007 National Survey of Mental Health and Wellbeing confidentialised unit record file.

Figure 3.31 Prevalence of high or very high levels of psychological distress, 2007



Note: Suicide deaths for 2007 have been subject to one revision by the ABS. See Appendix 1: Methods for information on revisions to cause of death data.
Source: AIHW National Mortality Database.

Figure 3.32 Suicide rates for young people aged 15–24 years, 2007

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Most frequently managed mental health problems[a]	National estimates of number of encounters for young people[b]	Encounters per 100 young people
Depression[c]	524 200	13.5
Anxiety[c]	221 700	5.7
Drug abuse	75 900	2.0
Sleep disturbance	71 000	1.8
Acute stress reaction	67 400	1.7
Tobacco abuse	56 300	1.5

Table 3.3 Most frequently managed mental health problems for young people aged 12–24 years, 2008–09

(a) One general practice encounter can involve more than one mental health problem managed.

(b) The national estimates of number of encounters are based on the proportion of encounters in the BEACH survey of general practice activity that is mental health-related, multiplied by the total number of encounters for young people aged 12–24 years as in Medicare Benefit Schedule claims data.

(c) Includes grouped category of ICPC-2 or ICPC-2 PLUS codes. For details, see Britt et al., General practice activity in Australia 2008–09 (2009).

Sources: 2008–09 BEACH survey conducted and analysed by Australian General Practice Statistics and Classification Centre (AGPSCC, University of Sydney); Medicare Benefits Schedule claims data, unpublished data.

Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Poor body image and sense of self-worth • Lack of parental supervision or positive role models • Low engagement with school and limited future career options • Significant trauma and grief • Social isolation • Unemployment • Low level of education • Sexuality issues • Access to firearms • Incarceration • Substance abuse • Victim of child abuse • Family history of mental illness **Protective factors** • Strong social support networks and connectedness • Feelings of safety and connection at school • Personal resiliency, coping and management skills • Personal interests and hobbies • At least one involved parent • Regular positive experiences and success • Positive outlook and perspective on life • Laws regarding age limits (e.g. sexual consent) • Access to health services • Education around youth issues • Economic security	**Socio-cultural determinants** • Lack of family stability • Poor interpersonal relationships • Exposure to conflict, abuse and violence • Lack of personal support networks and people • Peer expectations • Media stereotypes • Cultural/religious expectations **Socio-economic determinants** • Family or personal unemployment • Early school leavers • Low-income families **Environmental determinants** • Living in rural and remote areas – negative social stereotypes, less occupational and recreational opportunities and limited access to support services • Overcrowded or inadequate housing • Access to health and support services	**Young people most at risk** • Unemployed • Indigenous Australians • Low SES background • Low education • Rural and remote • Victims of bullying • Females • Homosexual youth • Incarcerated youth **Government and non-government initiatives** • Youth beyondblue • Reachout.com • MindMatters educational program • Kids Helpline

Table 3.4 Mental health key information

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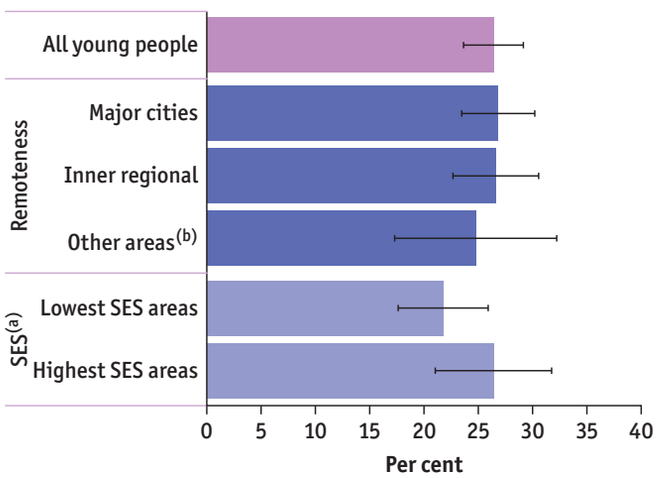
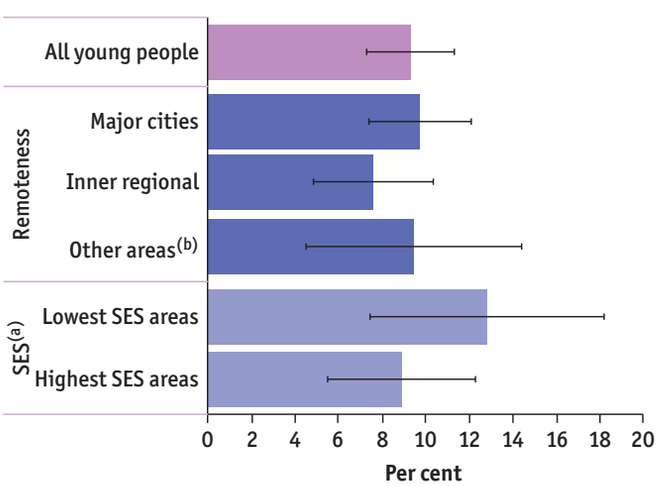
- The most commonly reported disorders were anxiety (15 per cent), substance use (13 per cent) and affective disorders (6 per cent).
- The most prevalent anxiety disorders were post-traumatic stress (50 per cent) and social phobia (35 per cent).
- Harmful use of alcohol was the most common substance-use disorder.



(a) Refer to Appendix 1: Methods for an explanation of 'socio-economic status (SES)' and 'remoteness'.
(b) Other areas include outer regional and remote areas combined.
Note: Indigenous data are not available from this data source.
Source: AIHW analysis of the ABS 2007 National Survey of Mental Health and Wellbeing confidentialised unit record file.

Figure 3.33 Prevalence of mental disorders among young people aged 16–24 years, by selected population groups, 2007



(a) Refer to Appendix 1: Methods for an explanation of 'socio-economic status (SES)' and 'remoteness'.
(b) Other areas include outer regional and remote areas combined.
Note: Indigenous data are not available from this data source.
Source: AIHW analysis of the ABS 2007 Survey of Mental Health and Wellbeing confidentialised unit record file.

Figure 3.34 Prevalence of high or very high levels of psychological distress among young people aged 16–24 years, by selected population groups, 2007

Leading causes of hospital admissions in 2008–09 for 12–24-year-olds were for:

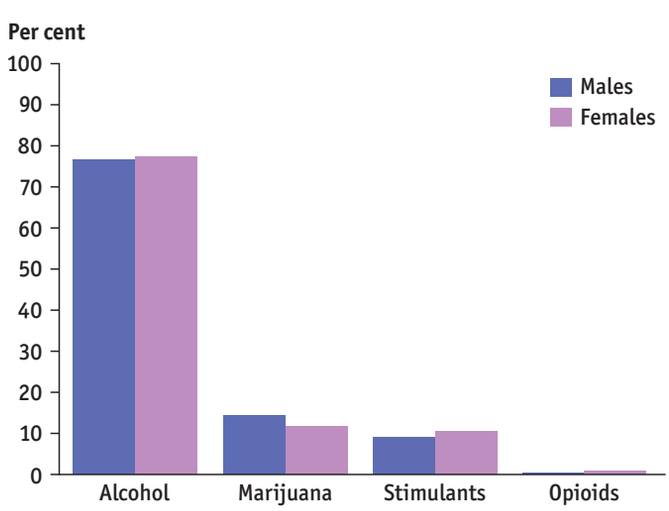
- mood disorders such as depression (24 per cent)
- mental disorders due to psychoactive substance use (19 per cent)
- neurotic disorders such as anxiety (18 per cent).

Alcohol consumption

Alcohol is a socially accepted drug, which is celebrated in many Australian subcultures. Common patterns of alcohol consumption among young people reflect a regular culture of binge drinking, defined as four or more drinks in one session. Young people often see alcohol as a necessary means of having a good time, and also as a means of escape from daily stress. Statistics indicate that young people drink at dangerous levels, between two and three times more than adults aged over 25. This behaviour in young people – especially under the age of 18 – can lead to many side-effects, including alcohol poisoning, alcohol-related injuries, long-term brain and liver damage, and addiction. Alcohol is often associated with motor vehicle accidents, risk-taking behaviours, physical assault, sexual assault and misadventure.

In 2007, among young people aged 16–24 years:

- Thirteen per cent reported having a substance use disorder.
- Males were more likely to have a substance abuse disorder.
- Alcohol was the most common drug of concern for 77 per cent of males and 78 per cent of females.



Source: AIHW analysis of ABS 2007 National Survey of Mental Health and Wellbeing.

Figure 3.35 Principal drug of concern for 16–24 year-olds with a substance use disorder, by sex, 2007

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Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Lack of parental supervision • Social isolation and feelings of loneliness • Having a first drink at a very young age – for example, 12 years of age • Poor role-modelling of the responsible use of alcohol by family and in the media • Mental health concerns • Low SES background • Cultural stereotypes • Easy access • Unemployment • Low level of education • Poly-drug use **Protective factors** • Positive sense of self-worth • Being educated • Access to personal support networks and people • Personal values and boundaries, which are either self-enforced or set in place by families • Laws regarding age limits • Education programs • Government health initiatives	**Socio-cultural determinants** • Negative cultural expectations that young people should regularly binge drink to enjoy life, increasingly evident among females • Broader acceptance of alcohol as necessary during social gatherings • Suffering from social disadvantage • Popular youth culture • Alcohol and sport **Socio-economic determinants** • Having high amounts of disposable income to spend on alcohol • Unemployment, leading to excessive amounts of spare time • Poor education about the dangers of binge drinking • Alcohol sponsorship **Environmental determinants** • Poor living conditions • Increased access to alcohol, either at home or having someone who will purchase for a young person under 18 • Limited alternatives to alcohol use • Venues and access • 'Happy hour' initiatives	**Young people most at risk** • People with a mental health disorder • Low SES background • Indigenous Australians • Males from rural and remote areas • Unemployed youth • High SES youth • Other drug users **Government and non-government initiatives** • Media campaigns – for example, drinkingnightmare.gov • NSW PDHPE syllabus • Youth Off the Streets • Rethinking Drinking education program • DrinkWise

Table 3.5 Alcohol consumption key information

Other key statistics include:

- On average, one in four hospitalisations of 15–25-year-olds happens because of alcohol.
- One in two Australians aged 15–17 who get drunk will do something they regret.
- Seventy Australians under 25 will be hospitalised due to alcohol-caused assault in an average week.
- Four Australians under 25 die due to alcohol-related injuries in an average week.
- According to the 2007 National Drug Strategy Household Survey, over 20 per cent of 14–19-year-olds consume alcohol on a weekly basis.
- Among teenagers drinking alcohol, 29 per cent of males aged 12–17 had consumed seven or more drinks on one occasion, and 32 per cent of females in the same age group had consumed five or more drinks on one occasion (Australian Secondary Students' Alcohol and Drug Survey, 2005).
- One study shows that approximately 40 per cent of 14–19-year-olds drink at levels that risk harm in the short term (2007 National Drug Strategy Household Survey).

Violence

There are increasing rates of violent behaviour in society, and this can affect young people in the family home, as well as in the wider societal context. Violence arises in many different forms. Examples include physical assault, sexual assault, domestic violence, sexual harassment and vilification, bullying, injuries from risk-taking and self-harm. Exposure to violence can lead to mental and emotional harm, such as uncontrolled aggression, anxiety and depression. Children who are exposed to violence are also more likely to become future victims or perpetrators. To respond to the increasing rates of violence in public, especially on Friday and Saturday nights, new curfew laws have been introduced, along with the provision of extra police and security patrols.

In 2008–09, for physical assault among young people aged 15–24 years:

- Seven per cent reported being the victim of physical assault.
- Adolescents aged 15–19 had the highest victimisation rates for physical assault.

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Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Social isolation • Poor social skills • Incarceration or contact with the juvenile justice system • Family breakdown and instability • Inadequate housing conditions • Exposure to domestic violence • Exposure to violent media – for example, video games • Derogatory attitudes towards other people, especially minority groups such as homosexuals • Low self-esteem and self-image • Substance abuse **Protective factors** • Access to personal support networks, people and services • Personal skills in communication and conflict resolution • Strong laws and police enforcement • Effective anti-bullying policies in schools and workplaces • Education of the community • Self-defence training • Adequate transport	**Socio-cultural determinants** • Domestic violence in the family home • Stereotypical expectations of males • Alcohol and drug abuse • Cultural and peer acceptance that condones violence **Socio-economic determinants** • Low SES background • Unemployment • Low level of educational attainment **Environmental determinants** • Influence of violent media – for example, video games, music and movies • High-density housing in areas of social disadvantage • Overcrowded living conditions	**Young people most at risk** • Females from domestic violence • Males as perpetrators of violence • People from rural and remote regions • People who are under financial and emotional pressure • Indigenous Australians • Intellectually disabled people **Government and non-government initiatives** • Community-based organisations such as Youth Off the Streets and Mission Australia • Peer-support programs • Burstingthebubble.com • White Ribbon Day

Table 3.6 Violence key information

Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Lack of driver experience • Drug and alcohol use • High levels of driver fatigue • Males who are involved in more road fatalities • Poor road design • Geographic location • Risk-taking behaviours • High-powered vehicles **Protective factors** • Driver education programs in schools and the media • Graduated licensing scheme • Strict road laws – for example, drink-driving and reduced demerit points • Driver Reviver • Road and vehicle improvements • Government initiatives	**Socio-cultural determinants** • Attitudes of young people about their perceived invincibility • Cultural stereotypes of male driving behaviour and risk-taking • Peer influence • Need for independence **Socio-economic determinants** • Young drivers tend to drive older cars with less safety technology, and spend less money on maintaining them • Young people are more able to afford their own car **Environmental determinants** • Living in rural areas – less public transport, faster speeds, unsealed roads and greater distances to travel • Safer roads – for example, dual-carriage freeways • Dangerous driving conditions – for example, wet-weather conditions	**Young people most at risk** • Males • Young people in rural areas • Young people who work at irregular times or do shiftwork • Drivers with the least amount of driving experience **Government and non-government initiatives** • NSW PDHPE syllabus • Crossroads Driver Education Program • Beginning and advanced driver education schools • Media campaigns • Double demerits

Table 3.7 Road safety key information

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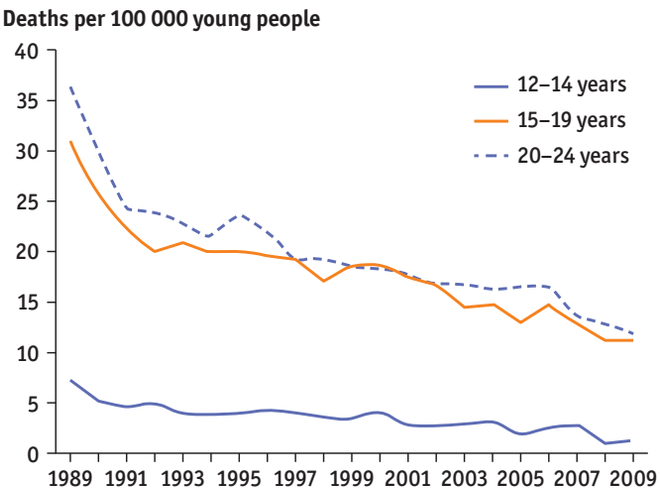
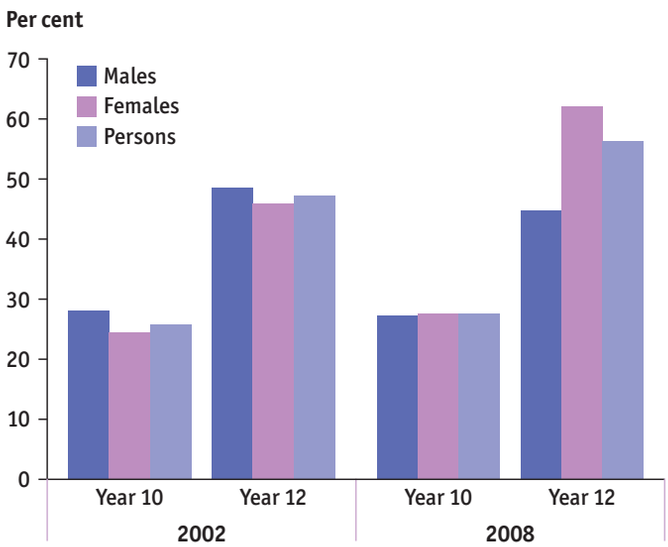


Note: Only accidents occurring on public roads are included.
Source: AIHW analysis of the Australian Transport Safety Bureau's Fatal Road Crash Database.

Figure 3.36 Road transport accident deaths among young people aged 12–24 years, 1989–2009



Source: Smith et al., *Fourth National Survey of Australian Secondary Students* (2009).

Figure 3.37 Students in Year 10 and Year 12 who have ever had sexual intercourse, 2002 and 2008

- The rate for males (10 per cent) was more than twice that for females (4 per cent).
- Nearly two-thirds (61 per cent) knew the offender, with one in 10 indicating a family member.
- The most common location was in the street or on open land (28 per cent).

In 2008–09 for sexual assault among 18–24-year-olds:

- A total of 0.6 per cent reported being victims of sexual assault.
- Twenty-nine per cent were reported to police.

Road safety

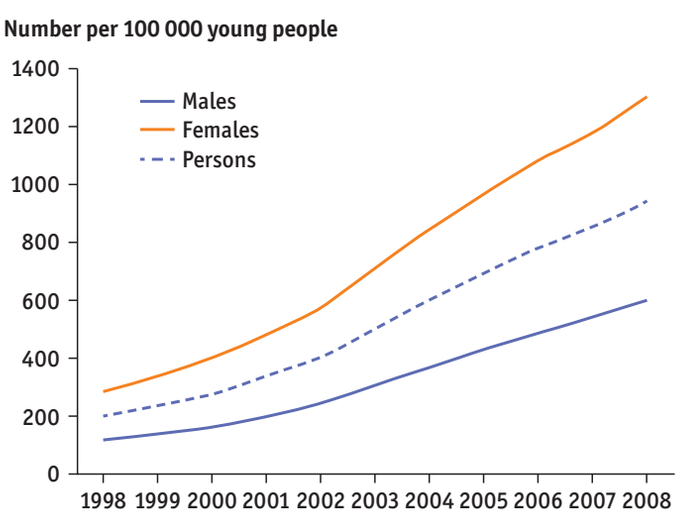
A key milestone of adolescence is gaining a level of independence. This is partly enabled by having a licence and a car, bringing freedom and convenience. For many young people, this is an exciting time, which corresponds with a period of life characterised by experimentation, low levels of responsibility and perceived thoughts of invincibility. This can place young drivers and those around them at increased risk of harm on the road, both inside the car and out. For the percentage of drivers that young people comprise on the road, they are over-represented in both fatal and non-fatal motor vehicle accidents. Much of this relates to the increased levels of risk-taking by young drivers, ranging from speeding, drink-driving and negligent driving to the misuse of mobile phones while driving.

Based on the Fatal Road Crash Database, in 2009 among young people aged 12–24 years:

- There were 370 deaths due to road transport accidents. This represents a substantial decline since 1989.
- Young males accounted for three-quarters of road transport deaths.
- Male death rates are three times higher than those for females.
- Most transport-related deaths were related to driving a car (45 per cent) or being a passenger (36 per cent).

Sexual health

As young people establish their own personal identity and value system, they make choices that relate to their sexual behaviours, relationships and orientation. The major factors that influence this sexual development include family, peers,



Source: National Notifiable Disease Surveillance System Database, unpublished data.

Figure 3.38 Chlamydia notification rates among young people aged 12–24 years, 1998–2008

ISBN 978-1-107-43512-4

	Males			Females			Persons		
	Year 10	Year 12	Total	Year 10	Year 12	Total	Year 10	Year 12	Total
Condom	79.0	69.0	73.0	74.0	61.0	65.0	75.0	63.0	68.0
Contraceptive pill	31.0	49.0	41.0	40.0	61.0	54.0	37.0	58.0	50.0
Withdrawal	11.0	3.0	7.0	14.0	9.0	11.0	13.0	8.0	10.0
Morning-after pill	5.0	4.0	4.0	4.0	12.0	9.0	4.0	10.0	8.0
IUD	4.0	0	2.0	2.0	1.0	1.0	2.0	1.0	1.0
Rhythm method	3.0	0	1.0	0.1	0.3	0.2	1.0	0.2	1.0
Diaphragm	1.0	0	1.0	0	0	0	0.4	0	0.2
Other	2.0	3.0	3.0	3.0	4.0	3.0	2.0	4.0	3.0
No contraception used	0.4	0	0.2	0.4	0.1	0.2	0.4	0.1	0.2

Table 3.8 Type of contraceptive method used or used by partner for sexually active students at last sexual encounter, 2008 (%)

Note: Some students reported more than one method of contraception, and therefore components will not add to 100 per cent.

Source: Smith et al., *Fouth National Survey of Australian Secondary Students* (2009).

the media, culture and religion. A person's sexual health is characterised by the physical, social and emotional consequences of their sexual identity and behaviours. There is also a strong link between a person's sexual and mental health.

Sexual relationships have the potential to greatly strengthen or harm (for example, through sexually transmitted infections) the health and well-being of young people. A major concern relating to the sexual health of young people is their poor attitudes towards the use of contraception (approximately 50 per cent). Rates of STIs are also increasing at alarming rates. Those who sexually engage with multiple partners are more likely to contract an STI, but these issues often involve the misuse of alcohol. There is a misconception among young people that they will not catch an STI. Furthermore, the potential long-term consequences of STIs, such as infertility, do not deter young people from taking sexual risks. For young women,

Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Low levels of education • Negative peer pressure • Unprotected sex and binge drinking • Being sexually active from a young age • Multiple sexual partners • Females with mental health concerns • Victims of abuse and family breakdown • Being a homosexual male **Protective factors** • Strong personal relationships and family support • Having a strong sense of self and personal values • Communication with sexual partners about contraception • Religious beliefs • Government legislation • Access to health services • Immunisation programs	**Socio-cultural determinants** • Attitudes and behaviours of peers • Media expectations of males and females • Cultural and religious expectations • Social isolation **Socio-economic determinants** • Low SES • Unemployed • Lack of education **Environmental determinants** • Access to support networks, facilities and GPs • Isolated geographic location • Lack of access to contraceptive methods	**Young people most at risk** • Sexually active youth • Females • Aboriginal and Torres Strait Islanders • People from rural and remote areas • Homosexual males • People with mental health concerns **Government and non-government initiatives** • NSW PDHPE syllabus • MindMatters • Get Tested – Play Safe campaign • Reachout.com

Table 3.9 Sexual health key information

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the potential of unwanted pregnancies is great, and this can have a significant impact on the health and quality of life of young women. For example, they are often unable to complete their schooling, leaving them with a lower socio-economic status.

In a 2008 survey:

- 70 per cent of Year 10 and 88 per cent of Year 12 students had experienced some form of sexual activity.
- Rates were higher among females than males.
- 91 per cent reported sexual attraction only to people of the opposite sex.
- 6 per cent reported sexual attraction to both sexes, 1 per cent to the same sex and 2 per cent were unsure.
- 40 per cent had experienced sexual intercourse (56 per cent in Year 12 and 27 per cent in Year 10). This represents an increasing trend for Year 12 students.
- Females were slightly more likely to have had sexual intercourse than males.
- 52 per cent of sexually active students had experienced sexual intercourse with only one partner in the previous 12 months.
- One in three sexually active students reported having experienced unwanted sex, particularly females (38 per cent).
- One in four sexually active students reported being drunk or high, with rates higher among males.
- The most common location was a partner's house.

In 2008, among sexually active students in Year 10 and Year 12:

- Almost all students (99.8 per cent) had used some form of contraception at their last sexual encounter.
- 68 per cent reported using condoms at their last sexual encounter.
- Use of the contraceptive pill had increased by a third since 2002 and use of the morning-after pill had doubled (8 per cent).
- Of those using the pill, half also used a condom.
- 51 per cent reported always using a condom. Males (61 per cent) were more likely than females (46 per cent) to do so.

In 2008, among young people aged 12–24 years:

- There were over 40 000 notifications for STIs.
- This was nearly four times the rate for 1998.
- STI notifications were highest in young females.
- Chlamydia was the most commonly reported STI.
- Gonorrhoea notifications had increased.

Body image

Western society places considerable emphasis on the importance of maintaining a certain look, as a sign of wealth and status. This extends to what constitutes a desirable body shape for females and males, and is reinforced through media stereotypes (such as air-brushing images to create a false ideal). Females are expected to be slim, tanned and athletic, whereas males are expected to be tanned, muscular and athletic. As a result, many young people place excessive emphasis on achieving a specific body shape and look, which can be detrimental to other areas of their life, such as their health, relationships, education and resources.

A serious consequence of such a preoccupation is the category of mental illness known as eating disorders. These include anorexia nervosa, bulimia nervosa and disordered or binge eating. Those particularly at risk of eating disorders are females with compulsive personalities who are overweight (even slightly) or obese. Males can also develop eating disorders, as well as use dangerous drugs and excessive exercise to achieve a more muscular body.

- Between 1995 and 2005, the prevalence of disordered eating behaviours doubled among both males and females.
- Eating disorders are increasing in both younger and older age groups.
- Eating disorders occur in both males and females before puberty, with the ratio of males to females approximately 1:10 during adolescence and decreasing to 1:20 during young adulthood.
- At the end of 2012, it was estimated that eating disorders affected nearly a million Australians.
- The prevalence of eating disorders is increasing among boys and men.
- 90 per cent of cases of anorexia nervosa (AN) and bulimia nervosa (BN) occur in females.
- Approximately 15 per cent of women experience an eating disorder at some point during their life.
- An estimated 20 per cent of females have an undiagnosed eating disorder.
- Younger adolescents tend to present with anorexia, while older adolescents may present with either bulimia or anorexia.
- Eating disorders are the third most common chronic illness in young females.
- Risk of premature death from an eating disorder is 6 to 12 times higher in young people than for the general population.
- Eating disorders are ranked 12th among the leading causes of hospitalisation due to mental health problems.
- Depression is experienced by approximately 45–86 per cent of individuals with an eating disorder.
- Anxiety disorder is experienced by approximately 64 per cent of individuals with an eating disorder.

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Anorexia

- Approximately 1 in 100 adolescent girls develops anorexia nervosa.
- 1 in 10 young adults and approximately 25 per cent of children diagnosed with anorexia nervosa are male.
- Anorexia has the highest mortality rate of any psychiatric disorder.
- 1 in 5 premature deaths of individuals with anorexia is caused by suicide.
- Among 15–24-year-old females, anorexia has a standardised mortality rate that is 12 times the annual mortality rate from all causes.
- The onset of anorexia usually occurs during adolescence, with a median age of 17.
- The average duration is seven years. Those who recover are unlikely to return to normal health.
- 40 per cent of people with anorexia nervosa are at risk of developing bulimia nervosa.
- Morbidity includes osteoporosis, anovulation, dysthymia, obsessive compulsive disorder (OCD) and social isolation.
- Although 70 per cent of patients regain weight within six months of onset of treatment, 15–25 per cent of these relapse, usually within two years.
- More than half of all anorexia sufferers have been sexually abused or experienced some other major trauma.

Bulimia

- The incidence of bulimia nervosa in the Australian population is 5 in 100. At least two studies have indicated that only about 10 per cent of the cases of bulimia in the community are detected.
- True incidence is estimated to be 1 in 5 among students and women (NEDC).
- The onset of bulimia usually occurs between 16 and 18 years of age.
- It is common for people suffering from bulimia to keep their disorder hidden for 8 to 10 years, at great cost to their physical and psychological health.
- 92 per cent of people with bulimia said that seeking help was entirely their own choice, whereas only 19 per cent of people with anorexia sought help themselves.
- 83 per cent of bulimic patients vomit, 33 per cent abuse laxatives and 10 per cent take diet pills.
- The mortality rate for bulimia nervosa is estimated to be up to 19 per cent.
- People with bulimia may have made one or several suicide attempts, and there is a high incidence of depression among bulimia sufferers.
- 70 per cent of individuals who undertake treatment for bulimia report a significant improvement in their symptoms.

Risk factors and protective factors	Socio-cultural, socio-economic and environmental determinants	Groups at risk and health-promotion initiatives
Risk factors • Low self-esteem • Participation in gymnastics, diving and dance, where personal presentation is important • Personality type that tends towards being controlling, competitive or compulsive • Victim of bullying • Social isolation • Sexually abused **Protective factors** • Family background that values good nutrition and physical activity • Strong personal connections and support networks • Access to health services • Healthy canteen policy	**Socio-cultural determinants** • Unrealistic media stereotypes, images and role models • Expectations of specific subcultures and genders about image and personal looks • Quality of relationships with peers • Family background • Advertising and marketing of products aimed at weight loss **Socio-economic determinants** • More disposable income to be spent on products that advertise weight loss or gain • Low levels of health education • Low socio-economic status **Environmental determinants** • Access to counselling and support services • Media saturation throughout society	**Young people most at risk** • Females after starting puberty • Gymnasts, divers and ballet dancers • People with a mental illness • Poor nutrition and exercise patterns • Victims of abuse **Government and non-government initiatives** • NSW PDHPE syllabus • MindMatters program • Reachout.com • www.sane.org • Butterfly Foundation

Table 3.10 Body image key information

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- Bulimia can become a means of coping with stressful situations, such as an unhappy relationship or a traumatic past event.
- Impulsivity and substance abuse are correlated with bulimia.

Binge eating disorder

- Binge eating disorder is characterised by recurrent binge eating without using compensatory measures such as vomiting, laxative abuse or excessive exercise to counter the binge.
- The prevalence of binge eating disorder in the general population is estimated to be 4 per cent.
- The incidence of binge eating disorder in males and females is almost equal.
- The disorder often develops in late adolescence and the early twenties.
- People with binge eating disorder are at risk of developing a variety of different medical conditions, including diabetes, high blood pressure and cholesterol levels, gallbladder disease, heart disease and certain types of cancers.
- Potential risk factors include obesity, being overweight as a child, strict dieting and a history of depression, anxiety and low self-esteem.

Source: Adapted from Eating Disorders Victoria website (see www.cambridge.edu.au/hscpdhpe1weblinks).

Other relevant/emerging health issues

Other issues that impact on the health of young people include gambling, cyber-bullying, party crashers, sexting and drink spiking.

Going further 3.18

Collaborate

In small groups, investigate the other relevant/emerging health issues. Look at:

- **their nature and extent**
- **their risk factors and protective factors**
- **their socio-cultural, socio-economic and environmental determinants**
- **the groups of young people who are most at risk.**

Checklist 3.19

Analyse TWO of the major health issues by examining:

- **their nature and extent**
- **their risk factors and protective factors**
- **their socio-cultural, socio-economic and environmental determinants**
- **the groups of young people who are most at risk.**

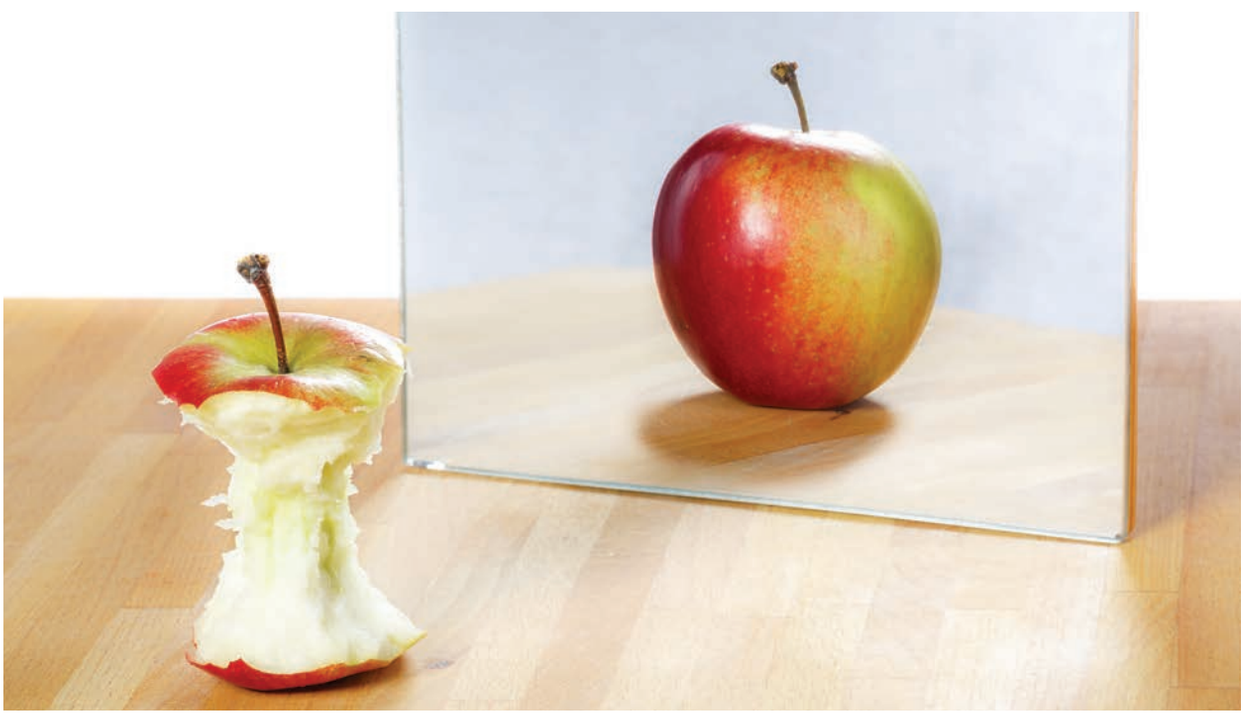

Figure 3.39 A concern with body image can lead to eating-related disorders such as anorexia and bulimia, although it is not the only risk factor

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3.3 The skills and actions required for young people to attain better health

Skills in attaining better health

Driving questions 3.20

1. List the specific changes you would like to implement to improve your level of health.
2. Did you consider any changes that would benefit areas of your health other than physical health?
3. If you didn't, what might this suggest about your own perception of your health behaviours and health status?

As young people grow in maturity and independence, they must take on increasing responsibility for their own health. While some lifestyle decisions can have a direct impact upon a young person's immediate health status (e.g. dangerous risk-taking, leading to a broken leg), other consequences are more subtle or won't arise until later in life. Mental health disorders tend to develop gradually without obvious signs and symptoms, and a young person may not realise that their lifestyle, drug use and relationships are contributing towards what has become clinical depression. Similarly, a poor diet, smoking and low activity levels may not immediately lead to obesity and heart disease, but the long-term risk is very high. Because young people tend to live with a more immediate and short-term outlook, they can also tend to ignore the potential for ill-health.

Figure 3.40 Young people should develop a positive attitude towards health

When a young person has a positive attitude towards their own health and well-being, there are a number of skills that can support them in achieving and maintaining this.

The responsibility for attaining good health does not just rest with the individual. Through the actions of caregivers, peers, schools, community groups and the government, young people can develop a range of skills that will empower them to be able to attain better health.

Building self-concept

As already mentioned, a positive sense of self-confidence, self-esteem, self-worth, self-identity and body image is vitally important for attaining good overall health. While each of these concepts is slightly different, they all contribute towards a person's overall self-concept. A healthy **self-concept** is developed through positive life experiences, a supportive upbringing and a well-rounded education. This will lay an invaluable foundation for the rest of a person's life. Some examples where this will be important include:

self-concept the belief a person has in their own strengths, abilities, personality and status; a sense of the kind of person you are

- having confidence in one's ability to achieve steady and satisfying employment
- developing a strong sense of purpose and meaning in life
- contributing to meaningful interpersonal relationships
- good conflict-resolution skills
- an inner strength and resilience to overcome difficult circumstances
- accepting who you are and being proud of your unique individual characteristics.

Developing connectedness and support networks

People are generally associated with a number of different social circles. For example, contact and relationships with colleagues, supervisors and

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clients at work can be a social circle completely removed from the social circle you associate with on the weekend, while playing sport or at school. Within each of these social circles, people have a deep-seated need to feel connected, to belong and to be genuinely accepted within that circle. Feeling like you are an outsider, on the fringes of a social circle, can be very disconcerting and can lead to feelings of self-doubt and loneliness. Forging stronger and more intimate relationships, where people know more about each other and are more vulnerable with one another, is a sign of strong connectedness within a group.

Good social and communication skills can allow a young person to be able to increase their connectedness, particularly when joining new social circles, such as during new employment. Strong connectedness – particularly in close relationships, such as with friends and family – can provide a strong support network for young people. If a teenager feels disconnected at school, they will be very hesitant to seek support and guidance from either peers or teachers during tough times.

Programs are often run by schools to increase their sense of belonging. Community action and group projects, such as community fundraisers or awareness-raising groups, can increase the sense of community in a diverse population, such as a school.

The Australian government initiative MindMatters (see www.cambridge.edu.au/hscpdhpe1weblinks) provides resources and professional development initiatives for teachers to support schools in promoting and protecting mental, social and emotional well-being.

However, when a young person is feeling isolated, or unable to safely share their concerns with someone they trust, they should seek a support network that can provide reliable advice and guidance. A good place to start is Kids Helpline

Figure 3.41 Social connectedness can provide a strong support network for young people

Figure 3.42 The MindMatters initiative promotes and protects mental, social and emotional well-being

or Reach Out (see www.cambridge.edu.au/hscpdhpe1weblinks), which can provide support and advice, and refer young people to appropriate professional services if need be. In these situations, young people who are socially isolated are at greater risk of alcohol and drug abuse, mental health disorders and risky sexual behaviours.

From a broader perspective, feeling connected to society at large, as a valued and contributing member, is important for the community in which a young person lives. This encourages good citizenship, and inspires young people to be proactive and to have a say in the social and political decision-making that affects them.

Developing resilience and coping skills

No individual is immune from life situations that are stressful and challenging. These could be physical, emotional, social, relational or financial in nature. For young people, being able to handle and recover from challenging circumstances can be difficult, as the skills of resilience and coping are often learned by experience. Young people also struggle to maintain a clear and accurate perspective on events (as do some adults), which can compound an issue. Often, their emotional reaction to a stressful situation is exacerbated by an inaccurate perception of the reality of the issue. To compound this, adults often recall that their teenage years were the most emotionally challenging, and the daily pressure from peers to be and look a certain way exerts a powerful force that can be difficult for young people to cope with.

To support young people during such events, parents and other significant adults can help by listening, offering reassurance and guidance, helping to keep an issue in perspective and maintaining a positive frame of mind. If a young person is at risk of significant mental harm, professional guidance from psychologists should be sought to help them work through the issue successfully.

ISBN 978-1-107-43512-4

Going further 3.21

Create

Kiah in Year 11 has had some recent difficulties. Her parents separated last year, and her Dad – who moved away – has been largely out of contact. She has also had some ongoing conflict with her friends, and she feels rejected by them. Teachers have noticed a change in attitude and decreased performance, as she struggles to stay on top of her school work. She seems to be withdrawn and lonely, and is showing signs of possible depression.

Analyse this situation, and give advice to Kiah to help her develop her skills in resilience and coping, even in such difficult circumstances. Give personal advice about how to manage her thought patterns and where she should go for help and support.

It is also important that young people experience challenging circumstances, particularly where they have some responsibility for them. These invaluable learning experiences will help them greatly in the future to either avoid such situations or be able to show greater resilience.

To stimulate such situations, programs such as the *Duke of Edinburgh Award* provide challenges that develop inner strength and confidence. The MindMatters program also has a strong emphasis on developing resilience as a key protective factor against mental health disorders.

Developing health literacy skills

Young people live in an age of information, where the internet has made virtually all information available instantly. Whereas skills in finding information have always been essential, today's young people must be able to discriminate between accurate and useful information, and that which is useless and possibly even harmful when making an informed health-based decision.

Figure 3.43 We learn about health-based issues at home and at school

Knowledge of health-based issues is taught predominantly at home and school. The K–10 PDHPE Syllabus in New South Wales covers a range of relevant health issues, such as smoking, drugs, driver education and mental health. Information about who and where to go for more help or information is also provided.

The skills required to access, analyse, assess and review health information are essential. When seeking advice for a particular health issue, web-based information can be very misleading and opinionated. Personal advice from a GP is far more reliable, and therefore young people need to be wise when seeking such information.

However, the underlying attitudes towards health are perhaps the most powerful tool in being health literate. Simply knowing that smoking is bad for your health is often not enough to deter some people. While a positive attitude towards personal health is not necessarily an obvious component of health literacy, it will compel people to continue to seek more knowledge and skills in ways that will enable them to attain the best possible health.

Figure 3.44 The attitudes we have towards health are our most powerful tool in health literacy

Checklist 3.22

1. **How can the above skills assist young people to enjoy good health? Provide examples.**
2. **Critically reflect on your own health and behaviours. Are there any future courses of action that would lead to better health?**

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Developing communication skills

Communication entails a complex set of skills that involve the expression, reception and processing of both verbal and non-verbal information. It is more than simply speaking clearly. Communication skills are developed and modelled primarily in the family home. School is also an important environment where communication skills are developed and refined. The more words and complex conversations to which a child is exposed, even if they are just listening passively, the greater their language development and communication skills will be.

For young people, the ability to clearly and confidently express one's feelings, opinions and ideas is very important. This will help them to develop and maintain healthy and meaningful relationships. Poor communication skills can prevent people from developing strong relationships, leading to social isolation. Of course, this increases the risk of mental or emotional problems, as relationships and a sense of belonging are such an important part of the human condition. Another aspect of poor communication skills is a person's ability to effectively resolve conflict quickly, with minimal hurt and distress. This can also lead to separation and distance in relationships. The development of conflict-resolution skills is often the result of modelling within the family home, as well as explicit learning through counselling and role-play scenarios.

Often, young people share a common frustration about not feeling heard, particularly about important issues that may affect them. Being able to express and clarify one's feelings within a relationship is essential for people to feel respected and heard. On sensitive family issues that can be very important to young people, feeling ignored can be extremely distressing.

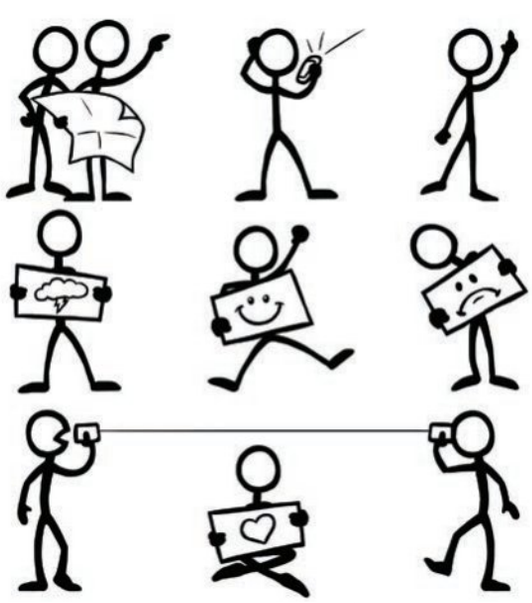

Figure 3.45 For young people, the ability to clearly and confidently express one's feelings, opinions and ideas is very important

Going further 3.23

Create

Write a short dialogue between a boyfriend and girlfriend as they sort through a particular issue. Include examples of the following communication skills:

- **active listening – where someone repeats back the feelings of the other person to check they have been heard**
- **assertiveness – clearly stating how you feel about a particular issue, while being willing to hear the other person's point of view as well**
- **clarity – being as clear as possible, and perhaps rewording a message if it was not clear enough**
- **conflict resolution – finding compromise and offering an apology if necessary, followed by forgiveness.**

Share or role-play your dialogue with the class, and peer-review the use of each communication skill.

Assertiveness is another key component of good communication. Having the confidence to express an opinion on an issue, as well as being willing to listen and consider other people's responses, is very important for maintaining good relationships. If someone is too aggressive or passive in their response to an issue, they may find themselves being ignored and disrespected.

As the nature of relationships change during adolescence, young people must be able to adapt and develop appropriate relationship skills for new types of relationships. For example, intimate romantic relationships have vastly different communication skills and needs compared with the relationship between an employee and employer, or between friends.

Accessing health services

Most young people live relatively healthy lives, in which the need to visit a doctor or use another health service is infrequent. However, at the time where help is needed, when an injury, illness or disease has been encountered, or when advice is

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Figure 3.46 Communication skills and needs vary vastly between romantic relationships and work, friend and family relationships

needed for a particular situation such as a sexual health concern, it is essential that young people are able to access and utilise the appropriate health service to help them improve and restore their health. Given the wide range of health services available in Australia, these skills in accessing health services are very important for supporting the health of the individual.

There are two aspects of accessing health services. The first is awareness of the various services that are available and within a person's local area. For example, if a person moves to a different city to study, quickly identifying local health services is very important. The second aspect is having the knowledge of how to utilise the health service. Simple things like making an appointment, paying an account and then getting a reimbursement back from Medicare are all necessary skills for accessing health services. For young people, doing this independently can sometimes be daunting.

There are a number of barriers that can negatively affect a young person's ability to access a necessary health service. Some young people are at risk of inequitable access due to circumstances partly out of their control, leading to social injustice. In these situations, health services work hard to overcome these barriers and ensure equitable access for all:

- **Socio-economic status.** This is a most significant barrier, and includes the level of disposable income available, employment status and level of education. Medicare and other online health services such as Reach Out can provide some access to doctors and counsellors. Doctors who bulk-bill their patients, charging all fees directly to Medicare, enable free access to a GP. However, other services such as medical specialists may charge extra fees outside of the affordability of some young people. The fact that most independent young people are either studying or in low-paying employment further compounds this problem. A low level of educational attainment may also correlate with an inability to access appropriate health services.
- **Location.** Young people who live in areas that are rural and remote may be disadvantaged by not being able to access the same range of health services that are available to those in metropolitan areas. While a GP may be available, specialist health services such as a psychologist may require travelling further for access.

Going further 3.24

Inquire

Think about the suburb in which you live and make a list of the various health services available to you. Then research using the Yellow Pages or the internet to add to the list.

Figure 3.47 It is essential that young people are able to access and utilise the appropriate health service

- **Language.** Where English is a second or additional language, difficulties in communicating and understanding complex medical information can prevent some young people from accessing health services. This is a particular problem for refugees, who may be in the early stages of learning English.
- **Gender.** In all age brackets, females are more likely to access health services for either minor or preventative health treatment and advice.
- **Personal reasons.** Young people sometimes report that they avoid accessing health services because of fear of embarrassment or lack of confidentiality. In the case of sexual health issues, this is a very common issue, with young people not seeking medical attention when

Figure 3.48 Seeing a counsellor is a type of health service that a young person may benefit from

they notice signs and symptoms of a possible sexually transmitted infection. Most health services that specifically offer support to young people are very clear about the anonymity that is provided to them. A belief in the professional nature of health practitioners is important for young people.

Overcoming these common barriers to accessing health services is a vital skill in helping young people to attain better health.

Becoming involved in community service

Finding opportunities for community service and involvement has many personal benefits that are important for young people to be able to attain better health. While signing up for a cause is a basic form of support (such as liking a Facebook page), this is not the same as making some level of personal sacrifice for the sake of others, whether it be through donating time or money.

Initially, this comes from a mindset and an attitude that encourages concern for the people, the world generally and events outside of your own orbit, which is a key aspect of good citizenship. Being self-centred and only concerned for things that directly affect their own sense of comfort and well-being can lead young people to become very insular and selfish. This often results in relationship breakdown and a general dissatisfaction with life, despite the good things that may exist. Despite the stereotype that many young people are like this, it is true that many are in fact very concerned and proactive about causes that they see as worthy of their commitment.

Apart from the wider impact upon the community and society in which a young person lives, community service and involvement provide young people with opportunities to widen their social circles, often mixing with people of all

Going further 3.25

Collaborate

In groups, identify a range of strategies that exist or could be used to overcome each of the health service barriers listed below.

Barrier to accessing health services	Strategies to overcome
Low levels of disposable income	
Not sure which health service to use	
Living in a remote location	
Poor English skills	
Feeling embarrassed	
Fears about confidentiality	

Table 3.11 Strategies to overcome health service barriers

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ages and backgrounds. This can lead to improved communication skills and confidence in speaking to strangers, and also many opportunities for the development of leadership and teamwork skills, through the planning and implementation of projects. It can also help develop an appreciation of and gratitude for one's own life, as well as sense of social and community responsibility. This all has a significant impact on a person's mental and emotional well-being, through the deep sense of satisfaction that comes from connectedness and helping others. Schools, families, churches and community groups are very important sources of inspiration and support to help develop this attitude, and to provide opportunities for such activities.

Possible avenues of community service and involvement could include:

- organising an awareness day and fundraiser at school, such as the Cancer Council's Daffodil Day or Biggest Morning Tea
- helping raise money for a charitable cause such as the Red Shield Appeal Doorknock
- helping serve meals to homeless people in a local shelter
- assisting with a community environmental service project such as Clean Up Australia Day
- promoting a health initiative at school, such as R U OK? Day
- gaining signatures on a petition to stimulate political change, such as funding for recreational facilities for youth
- volunteering for a surf lifesaving patrol.

Figure 3.49 Community service and involvement has benefits for the community and the individual

Creating a sense of future

When young people feel like they have a sense of direction in their life, it provides purpose and motivation. Compare the levels of motivation of two HSC students. One student knows exactly what they need to do to get into a particular university course, while the other has no ideas about what they would like to do once they finish Year 12. The student with the set goal has a reason for working hard and aiming to achieve at their maximum potential. Having a mindset that is forward thinking is a very motivating tool. The same can be applied to starting an exercise and diet-modification program. Having a desired level of weight loss in mind will provide greater motivation.

Figure 3.50 A forward-thinking mindset is a powerful motivational tool

A strong sense of self-belief in one's own ability and self-worth can also help young people to be driven by who they want to be in future years. While at school, this can contribute to greater engagement, as well as act as a protective factor against a range of poor health behaviours, such as drug and alcohol abuse and risky sexual behaviours. When you value your future self, you make decisions today that protect and preserve who you desire to be in the future. A supportive family upbringing plays an important role in reinforcing this, whereas young people who suffer neglect may feel a hopelessness about their future self, leading to a range of social and mental health concerns.

A significant feature of a young person's future is their potential career – their source of income and employment as an adult. Encouraging young people to value the importance of a good education in helping secure a positive future is a key role of schools, as they seek to build the confidence and structures to support young people. The government also invests significant energy and money into providing pathways and support for young people to identify and work towards securing meaningful and stable employment. The My Future website (see www.cambridge.edu.au/hscpdhpe1weblinks) is an example of this. The government's Australian Youth Forum website (see www.cambridge.edu.au/hscpdhpe1weblinks)

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Figure 3.51 Volunteering for a surf lifesaving patrol can be a rewarding activity

is another source of guidance to enable young people to successfully establish themselves as independent, responsible, contributing and resourceful members of society. It is targeted specifically at young people, to keep them informed about relevant events and information.

Young people who feel anxious, apathetic or pessimistic, or lack confidence about their future success and well-being, often make poor health and lifestyle choices, as they do not feel there is a sense of direction and purpose in their lives. Feeling confident and optimistic, and having a positive outlook about one's future, where success and a high quality of life are possible, is essential for young people to be able to attain good health.

Going further 3.26

Inquire

Access the Australian government's Australian Youth Forum website (see www.cambridge.edu.au/hscpdhpe1weblinks). Answer the following questions:

1. **Considering health literacy, what type of issues are important?**
2. **How does this website help young people create a sense of future?**

Summary 3.27

Outline the skills that can be utilised to attain better health.

Actions targeting health issues relevant to young people

Note: In this section of the syllabus, students are required to evaluate a range of strategies that have been implemented by government and non-government agencies that target TWO major health issues impacting young people.

The examples that follow are intended to provide a start, and cover all health issues from the syllabus. Students must research further for their selected health issues.

There are many strategies implemented by various government and non-government sources that target the health issues impacting young people. As students study this section of the syllabus, they should look for clear links demonstrating the action areas of the Ottawa Charter. These various strategies can fall under three categories:

- social action
- legislation and public policy
- health-promotion initiatives.

Social action

There is a strong correlation between the health status and behaviour of an individual and the community to which they belong. This community extends from the strong influence of a person's family and upbringing into the social circles with which an individual regularly has contact at school, work and for recreation, and then branches out into the broader society within which an individual lives. This is reinforced by consideration of the health status of some of the demographic groups within Australia, such as people who live in rural and remote areas or Aboriginal and Torres Strait Islander peoples.

While an individual is able to make some positive changes to their own health behaviours (and hopefully their health status), it is important for there to be community-based action and momentum when an effort is being made to positively impact upon a specific community's health status.

Particularly for young people, who are very driven by the people with whom they associate, creating a supportive environment through strengthening community action can help them to get involved and stay connected with the health-based decision-making and other programs that directly affect them. This increases the likelihood that the health-promotion initiative will encourage the individual to make positive health-behaviour changes.

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It is very important for government and non-government agencies involved in health promotion to involve young people in the design and implementation of targeted health-promotion activities. Some examples include:

- mental health – R U OK? Day in schools and workplaces
- alcohol – Generation Next blog
- violence – White Ribbon White Tie Gala Dinner
- road safety – Driver Reviver stations
- sexual health – New South Wales Government Youth Week Forum, 'Be Active, Be Happy, Be You'
- body image – Butterfly Foundation 'It's a Con' advertisement competition.

Legislation and public policy

Governing bodies, such as governments, businesses and schools, are responsible for creating and enforcing **legislation** and **public policy** to preserve, protect and promote the health of the people for whom they are responsible. This is particularly true of the legislation and public policies that will likely impact upon the health of young people. They should also increase the ability of young people to make positive health-related decisions.

legislation laws and rules set by a government or governing authority

public policy guidelines, plans and proposed courses of action, that will influence decisions, actions and other matters that affect the wider community

Some common examples of legislation and public policy that affect young people include:

- mental health – school anti-bullying policies
- alcohol – under-age alcohol- and tobacco-related laws
- violence – school-based discipline systems for dealing with violent acts
- road safety – road and special licensing laws for younger drivers; community-based curfews
- sexual health – funding for STI educational programs by community health workers
- body image – a voluntary fashion industry code of conduct.

Health-promotion initiatives

Health-promotion initiatives seek to raise awareness, develop relevant knowledge and skills and encourage and empower young people to make positive health decisions that will lead to improved health outcomes, both now and into the future. Government and non-government organisations have a strong interest in promoting health to young people, as the desired health outcomes have many positive benefits for both the individual and society. It is increasingly being recognised that when governments work alongside community groups and in partnership with NGOs, there is an increased effectiveness in the promotion of health.

Going further 3.28

Inquire

1 In small groups, evaluate the current effectiveness of the graduated driver licensing scheme in New South Wales. Answer the following questions:
   - What aspects do you think are adequate?
   - What aspects do you think need to be more stringent?
   - What aspects do you think need to be more lenient?
   - To what degree do you think the graduated licensing scheme in New South Wales leads to improved health outcomes for young drivers and passengers?
2 Complete a similar review of a particular policy that exists in your school, regarding an issue such as sun protection or bullying. Make recommendations for further improvement of the policy.
3 As this activity also reflects social action (as described above), discuss the challenges and opportunities that exist in undertaking such a review process (reflect also on the Ottawa Charter action area 'strengthening community action').

Going further 3.29

Inquire

Imagine that the health status of Australia's youth is significantly improved over the next five years, as reflected in lower mortality and morbidity rates for all major illnesses and injuries. Make a list of the numerous benefits for both the individual and society of this outcome. Share your answers with the class.

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To increase the effectiveness of a large-scale health-promotion campaign, a range of health-promotion initiatives should be implemented. The five action areas of the Ottawa Charter provide a framework or blueprint for effective health promotion. Students should have an excellent understanding of each action area, and be able to readily identify examples that reflect them:

- developing personal skills
- creating supportive environments
- strengthening community action
- reorientating health services
- building healthy public policy.

Some examples include:

- mental health – government: Headspace; NGO: Youth beyondblue and Butterfly Foundation
- alcohol – government: Drinking Nightmare; NGO: DrinkWise and DrugInfo
- violence – government: Youth Say No; NGO: No to Violence and Bursting the Bubble
- road safety – government: Youthsafe; NGO: RYDA Australia
- sexual health – government: Get the Facts; NGO: Sexual Health Australia and Reach Out
- body image – government: Positive Body Image Awards for the fashion industry; NGO: the Butterfly Foundation and Sane Australia.

Going further 3.30

Inquire

For the TWO health issues being studied, visit the website of the health-promotion organisations mentioned above (or another of the student's own choice) and identify a range of examples of strategies and initiatives that reflect each action area of the Ottawa Charter.

Summary 3.31

1 **Identify how social action can help to target major health issues impacting young people.**
2 **Describe how legislation and public policy help to target major health issues impacting young people.**
3 **Evaluate how health promotion initiatives help to target the major health issues impacting young people.**

Checklist 3.32

Evaluate a range of strategies that have been implemented that target TWO major health issues impacting young people.

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Chapter summary

- The progression through adolescence sees individuals make the transition from child to adult and experience a rapid physical, emotional, intellectual and social maturation.
- In Australia today, access to information is almost instantaneous, due to our modern communication systems. This can have both positive and negative effects on young Australians.
- Young Australians exhibit different morbidity rates, from different causes, compared with the general population. Leading causes of morbidity among young Australians are mental disorders, injury and poisoning.
- Attitudes of young people are shaped by parental/family and peer influence, experiences and the values of wider society. Young people are hugely influenced by their environment; therefore, it is important that schools and parents of young people create supportive environments to facilitate healthy choices and behaviours.
- The multicultural nature of modern Australia is beneficial for the health of young people. It teaches young people not to discriminate, and promotes tolerance, acceptance and understanding of other cultures.
- Education is integral to a young person's health and well-being, as well as their future productivity and contribution to society.
- All relationships have the potential to be personally beneficial and meaningful, or abusive and damaging. All individuals in relationships have rights and responsibilities to ensure they remain positive, regardless of the position and status of each.
- Self-identity goes much deeper than just media and clothing preferences. Understanding and recognising one's own unique personality characteristics, personal strengths and shortcomings, interests, personal background and sense of place in the world is critical to helping an individual develop a strong sense of identity. Even more valuable than self-identity, however, is the concept of self-worth.
- Young people experience increased daily stress – for example, family breakdown, feelings of worthlessness and loneliness and limited career opportunities. However, they often do not have the necessary coping skills to self-manage either high levels or long-term sources of stress. Major issues are depression, anxiety and substance abuse.
- Health-promotion initiatives seek to raise awareness, develop relevant knowledge and skills and encourage and empower young people to make positive health decisions that will lead to improved health outcomes, both now and into the future.

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Exam-style questions

1 Compare the young people of today with the youth of previous generations.
2 Compare the health of young people with that of other age groups.
3 Identify current areas of ill-health for young people.
4 Propose strategies to overcome the factors that adversely affect the health of young people.
5 Explain the determinants of health that influence the health of young people in Australia.
6 Evaluate the developmental aspects that affect the health of young people.
7 Analyse a major health issue that impacts young people.
8 Analyse how a range of skills can assist young people to enjoy good health.
9 Evaluate strategies that government and non-government agencies have implemented to target one health issue that impacts on young people.
10 Explain how the development of health literacy skills enables young people to achieve better health.

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Chapter 4 Sport and Physical Activity in Australian Society

HSC Option 2

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

- *the ways in which the meanings of sport and physical activity have changed*
- *the links between sport, and national and cultural identity*
- *the contribution of the mass media to understanding values and beliefs about sport*
- *the links between sport, physical activity and gender.*

Key terminology

amateur
commodification
commodity
competition
cultural identity
manliness
muscular Christianity
patriotism
physical activity
professional
sexism
sexploitation
sport

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4.1 The changing meanings of sport and physical activity

Driving question 4.1

Imagine you are introducing an alien to the sporting culture that exists in Australia. They visited Australia when the country was first settled by the British, and have now returned. Compile a list of essential things that reflect sport in Australia and propose how the alien will use this information to successfully adopt a sports lifestyle in your current society.

sport an activity involving physical exertion and skill that is governed by a set of rules or customs and is often undertaken competitively

physical activity any movement by the body that requires expenditure of the skeletal muscles

Sport and **physical activity** have been integral to the social development of many countries around the world. In Australia, the nineteenth-century influence of the British empire in the development of our sport and physical activities is strongly evident. Popular British sports such as cricket, tennis, rowing, horse racing and soccer infiltrated many countries, including Australia. An example of this is soccer in China and cricket in India. It is therefore interesting to examine the history of the early British colony in Australia to develop a thorough understanding of how sport and physical activity evolved.

The beginnings of modern sport in nineteenth-century England and colonial Australia

Sport was well established in England at the end of the eighteenth century. A sporting culture was valued within English society, and resources were directed to growing and developing the popular sports of cricket, golf, hockey, soccer, tennis and horse racing. This sporting ethos within English society was highly influential in the newly settled colony of Australia. The early English settlers wanted to establish their superiority and cultural traditions that were strongly formed back home.

The new colony of Australia presented a tougher climate than the one to which the English settlers were accustomed, so sport became more about survival and everyday physical activity than a recreational pastime. During this initial establishment of Australia as a nation, boxing and horse racing stood the test of survival, as men particularly liked to gamble on these sports. Boxing thrived, as it required minimal equipment and could be performed in any location. Over time, the upper classes began playing sport regularly on Saturdays, while the lower classes would play sports on public holidays. Soccer grew in popularity during this time.

Australia experienced an influx of migrants in the mid-nineteenth century, with the discovery of

Figure 4.1 Nineteenth-century tennis in Hamburg, Germany. Engraved by anonymous engraver and published in the *Illustrated London News*, 1887.

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gold. The gold rush brought wealth and a diversity of people, and influenced the development and organisation of sport. Horse racing was established in the country in the 1830s, and gained support across the country. It helped to reduce the social divide between the upper and lower classes of society. The character of Australian sport was established as new colonies emerged across the country. New cities were built and infrastructure was included to support a sporting way of life. The first sports clubs were established as sport became formally organised for players. After horse racing, cricket was the next official organised sport, with the Melbourne Cricket Club founded in 1838. This period saw the introduction of inter-colonial matches across the country. From these games, an international game was played in England, with Australia sending an all-Indigenous team in 1868.

An early form of Rugby Union was regularly played in Queensland and New South Wales; however, the Victorians were adapting their own form of the game, Victorian Rules Football (VFL), which was officially codified in 1858 as what we now know as Australian Rules Football (AFL).

With the majority of the population residing on the coastal fringes, sculling and swimming gained popularity. These aquatic pursuits were seen as healthy physical activities, and public bathing areas were established.

Cricket was quite dominant during this colonial era, with the famous rivalry for the Ashes beginning after Australia defeated the English cricket team in 1882. Field hockey was established in the late 1890s, with both men and women participating.

Going further 4.2

Communicate

As a group, discuss what sport meant to the early settlers in Australia. What does it mean to Australians today?

Links with manliness, patriotism and character

It was thought that employing young men as army personnel would help to secure the loyalty and strength of the British empire. Men were encouraged to participate in sport to develop their physical strength and skill. Sport also provided the avenue for men to display their **patriotism** and altruism, or self-sacrifice, that might carry over to defence and sacrifice for the welfare of others if necessary. Women were also expected to aid the defence of the British empire by supporting their husbands when they travelled to their assigned posts.

patriotism national loyalty, love and support for and defence of one's country

Sport originally associated **manliness** with rough and tumble activity where men could demonstrate their brute strength and power. This later changed to a more formal association as men from middle-class society began participating in sport. This redefined the rough overtone of manliness and sport. The affiliation of sport with public education systems in Britain influenced the change of the societal image of manliness. This new ideal reframed sport to encourage a more disciplined and moral society. It was thought that participation in sports such as cricket and rugby could encourage positive character traits of leadership, perseverance, self-resilience and loyalty. These new ideals were emphasised in the participation in sport and physical activity for schoolboys as they ventured into adulthood. Traits were developed that were approved by society such as determination, courage, steadiness and decisiveness.

manliness the qualities ascribed to men, such as strength or bravery

As the Australian colony grew, it was deemed important that the undisciplined and jagged members of society could benefit from character-building activities associated with sport. The other members of society – those who were considered disciplined, responsible gentlemen – exhibited fitness, health and moral uprightness. This ideology, which was popular in the late 1850s, was known as **muscular Christianity**, and it became influential in schools, universities and men's clubs. This concept of a healthy body combined with fine morals of sportsmanship, playing by the rules and leading an active Christian life influenced sport participation. Cricket was highly regarded to develop moral character.

muscular Christianity nineteenth-century concept of a healthy body combined with fine morals of sportsmanship and leading an actively Christian life

The meaning of amateur and professional sport

The meaning of sport in the nineteenth century was closely related to social class. The working classes mainly participated in sport when it was seen as a source of entertainment and making money through gambling. Upper-class involvement in sport was more about recreation and social engagement. The wealthy had time to train and compete in sports without losing any income, as the lower classes would. This ability to play sport as a pastime enabled them to compete in competitions without

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amateur someone who participates in sport without being paid

payment, and thus their **amateur** status was established. This participation kept the social classes well divided, and social boundaries in place.

Amateur sporting clubs controlled sports and the lower classes could not afford to join, and therefore could not play. Cricket, hunting, golf, tennis and rugby became pastimes of the upper classes where sport was undertaken for pleasure and enjoyment. Membership of these clubs was expensive, and those who did not have the finances to join were rejected. Although the sports clubs were promoting the qualities of fairness and sportsmanship, they were essentially highlighting and emphasising the social boundaries of society.

The wealthy participants would not risk their amateur status by accepting any form of payment for their participation in sport. Those who made a living out of playing sport were seen to bring the ideals of sport into disrepute. Amateurism was an essential core value of sport, encouraging team interest above one's own gain, whereas those open to reward for participating were viewed as cheaters. The lower classes were simply segregated by their financial status. They needed to develop their own form of entertainment, and **competition** that allowed players to receive payments for playing began. The gentlemanly pursuit was now open to corruption and bribery.

competition act of contesting a game, race or challenge

professional players who receive payments for playing a sport, or make it their livelihood

In 1985, Rugby League became its own code, breaking away from Rugby Union. Rugby League became widespread and developed into a **professional** sport, while Rugby Union remained amateur. Although many working-class people tried to maintain their amateur status, it became impossible, as they simply could not afford to participate in sport without financial help. Any support received and accepted by winning a competition, or money from a sponsor for equipment, travel or clothing immediately meant an athlete lost their amateur status.

Figure 4.2 Australian Rugby Union football team in action, 1929

Going further 4.3

Inquire

Account for the reasons why Rugby Union and tennis remained amateur sports until the 1990s, while many other sports became professional.

The purpose of classifying amateurs and professionals was to effectively highlight the social boundaries that existed in Australian sport at this time. There was definite action taken to keep the working class away from the sporting and leisure activities of the upper and middle classes. The modern-day concept of professionalism was introduced to preserve sport for athletes who competed for pleasure and benefits rather than monetary prizes. Boxing is still classified as an amateur sport, as were tennis and basketball until they turned professional in 1992.

Women's historical participation in sport

In the early nineteenth century, physical activity was considered inappropriate and dangerous for females. Girls were taught that they were delicate, and their health needed to be preserved for having children. It was generally believed by medical experts of the time that women who were competitive, ambitious or aggressive were prone to disease, and that women who engaged in sport could damage their reproductive systems or transmit unfavourable characteristics to their children.

Kathrine Switzer, the first woman to officially run in the Boston Marathon in 1967, was warned by her high school basketball coach about the danger of excessive jumping displacing the uterus. Instead, women were expected to support their husbands by running the household, having children and raising them. Dancing was the main physical activity for women, and this was also as a partner to a male, or as a means of meeting a prospective husband.

These beliefs have been slow to change. Women campaigned actively during the 1880s to have physical education included in girls' school education, but society's attitudes dictated that the sports considered acceptable for women were

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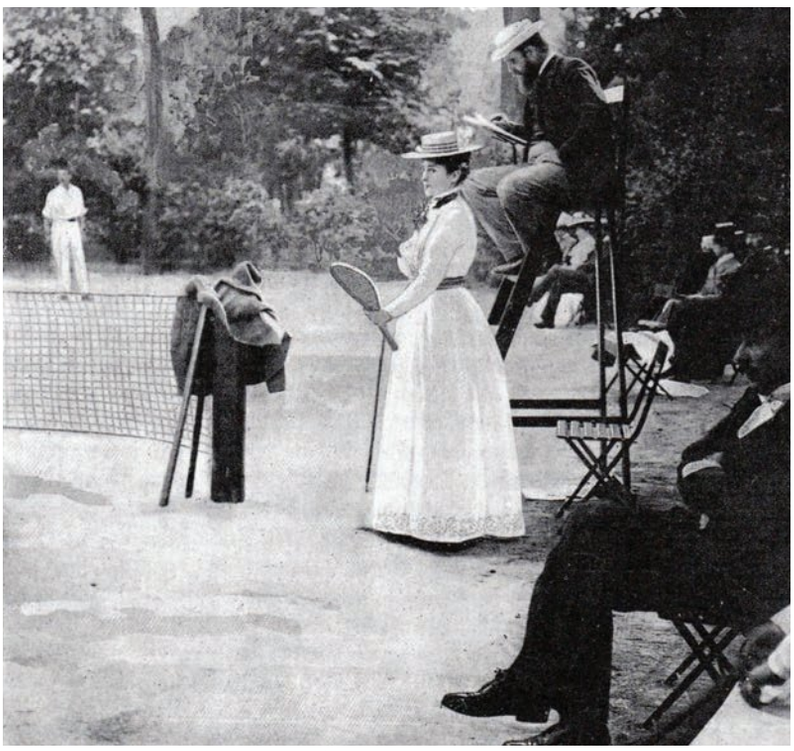

Figure 4.3 Olympic games tennis tournament, Paris, 1900

those that did not challenge traditional gender definitions. They included more gentle activities like croquet, archery, tennis and badminton. Even then, the clothing that women were expected to wear was heavy and restrictive.

By the beginning of the twentieth century, swimming was considered an appropriate activity for women. Even so, women continued to struggle against social mores, wearing long, woollen swimsuits, and were excluded from participating in swimming races in the company of men.

Annette Kellerman, a professional Australian swimmer who also starred in Hollywood silent films, found these bathing suits restrictive and awkward. Instead, she wore an Australian-style men's racing suit, which left half her thighs exposed. Although she held most of the world records in swimming for women by the age of 21, she was arrested two years later for indecent exposure because her swimsuit revealed her arms, legs and neck. The charge was later dismissed.

Swimming became an Olympic event in 1896, but women were not allowed to compete until 1912. In that year, Fanny Durack of Australia won a gold medal in the 100-metre freestyle race, the only individual event for women. Wilhelmina (Mina) Wylie, another Australian, won silver. The New South Wales Ladies' Amateur Swimming Association previously had argued that it was indecent for men to be able to watch female competitive swimming, and it was fortunate for Australia that the ban was lifted shortly before the Olympics. Yet biased attitudes about women in sport persist. Even today, the longest swimming event for women is 800 metres rather than the 1500-metre race swum by men.

World War I did much to change societal attitudes about women, who entered the armed forces alongside men and demonstrated that they could take on traditionally male roles. Mores about acceptable physical activities began to change as a result, with a selection of athletic events being offered as appropriate for female Olympic competition in 1928.

Schools began to organise competitive sports for girls, and many local sporting clubs and associations started up. Hockey, cricket, softball and netball became popular sports for women. The positive progression for women's sport increased participation rates; however, societal misconceptions persisted. The number of events available to women at the Olympic Games has gradually increased, but it wasn't until 1984 that women could finally compete in longer distance events, including the marathon, disproving the idea that the event is too strenuous for women.

Women have had to struggle against a number of factors that have inhibited their participation in sport. **Sexism** has limited the number of sports available to women, and also their ability to perform (for example, due to unsuitable apparel). Other factors are historical, like erroneous ideas about female physiology and traditional expectations about the roles appropriate for women. Other factors have maintained this imbalance, such as a lack of parental encouragement and the existence of fewer female sporting role models in the media.

sexism attitudes that stereotype people according to their gender, rather than judging them on individual worth

Figure 4.4 In the years after World War I, women's experience in sport began changing dramatically

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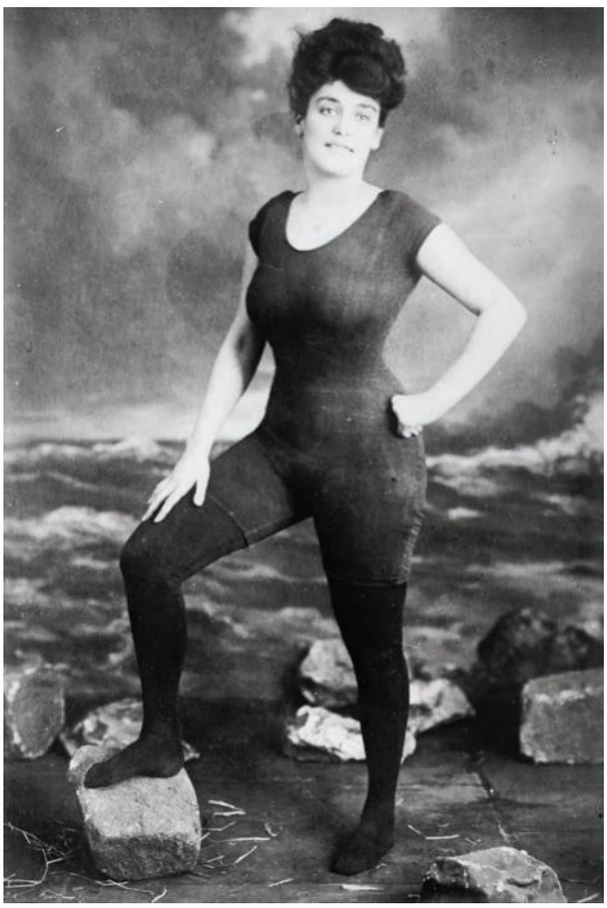

Figure 4.5 Annette Kellerman (1887–1975), Australian professional swimmer, vaudeville and film star in her famous custom swimsuit (designed to allow for serious athletic swimming, unlike conventional women's swimwear of the period, but considered indecent by some)

Summary 4.4

1 Explain the terms 'manliness', 'patriotism' and 'character' as they relate to sport.
2 Identify examples of patriotism, manliness and character-building in current Australian sports.
3 Explain how the nature of sport and physical activity in nineteenth-century England and colonial Australia has shaped sport in Australia today.
4 Outline the underlying social conditions that resulted in the growth of professionalism.
5 What was women's role in sport in the nineteenth century? How has this changed over time?
6 Analyse how sport and physical activity have changed from the nineteenth century to today.

Checklist 4.5

1 How have the meanings of amateur and professional sport changed?
2 How did the meanings of sport differ for different social groups?
3 How did women's and men's sports participation differ, and why?

Women now enjoy greater freedom to participate in the sports in which they are interested, and society promotes sport as equally beneficial for males and females.

Sport as a commodity

Sport is enjoyable to play and also to watch, but it has become far more than this. Sport and sportspeople can capture the hearts and minds of millions – like Cathy Freeman winning gold at the Sydney 2000 Olympics. Where there is public interest, there is also the opportunity to make money. Media coverage, advertising, ticket sales and merchandise all make sport attractive to business, and some sports and sporting teams have therefore undergone **commodification**, which means that they can now be owned, bought and sold.

commodification the process by which something that is of no commercial value is turned into something that can be bought or sold

The development of professional sport

The idea that some individuals would play sport for the entertainment of others is not a new one. People have been interested in watching competition based on athletic ability for thousands of years. There are cave paintings showing crowds watching wrestling matches that date as far back as 7000 BC.

The Industrial Revolution gave more people free time to watch sport, and the advent of mass media in the twentieth century enabled sport to be shown to a large and willing population. It was a natural consequence that workers who were able to earn money from sport, and who therefore had the time to devote to training and competing, were able to dominate competitions. It became necessary to be a professional sportsperson in order to be competitive.

Professionalism has advantages, in that athletes can perform to their highest potential and spectators can see a higher level of competition. Businesses are also able to gain an increased

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market for their products, and they derive important economic benefits that flow through to society in general. Yet problems also result from the professionalism of sport. Sport is often now a money-making exercise rather than a game to be enjoyed, and at times sportspeople have turned to unethical means – like drugs – to improve their performance.

The move toward professionalism was resisted most strongly in the Olympic Games because of the idea that the Olympics should represent the love of sport rather than money. There have been occasions when athletes have had medals stripped from them and achievements nullified for accepting payment for sporting participation prior to their Olympic involvement. It wasn't until 1988 that professional athletes were allowed to compete – partly to lure the greatest and most famous athletes in the world, many of whom were professionals, and therefore increase international interest in the Olympic Games.

Sport as big business

Sport would not exist today without big business. Australian households spent a total of $8293.8 million on sporting and recreational productions in 2009–10. This represented an increase of 21 per cent from 2003–04. Sport is both a business and a highly marketable **commodity**.

commodity something of value that can be bought or sold

Entrepreneurs used the increasing interest and involvement in sport to make a profit. As spectator numbers increased, companies realised they could reach the masses by advertising their products at large sporting events. Alcohol and tobacco companies were the first to do this.

The most influential event in sport as big business occurred when media mogul Kerry Packer created World Series Cricket in the 1970s. The game of cricket was changed forever, and so was every other sport.

This growth of modern sport is paralleled by the growth in the business of executing a sporting event. Grassy hills where spectators sat on blankets have given way to multi-level grandstands with permanent seating, corporate boxes, fast food outlets, licensed bars, event staff and security. Major stadiums now include grandstands, tiered seating, security guards, food outlets and roaming ice-cream carts, souvenirs, toilets, cleaners and technicians. Major grounds, such as the Melbourne Cricket Ground (MCG), have specially qualified staff hired to maintain the immaculate playing surface on a year-round basis. Summer in Australia draws the crowds to cricket, and the increasingly popular soccer A-League games, while the cooler months bring AFL and Rugby League alive in these stadiums.

Sponsors of major teams and clubs have excelled in making substantial returns from investing in sport. The high participation rates of Australians watching and participating in sport have not gone unnoticed by big business. Well-directed marketing campaigns convince novice sportspeople of the need to update and purchase the latest technology in their chosen sport. Sports heroes are chosen to promote everything from apparel and equipment to vitamin supplements.

People are assured that they can perform like their heroes if they wear the same kind of clothing, use the same brand of equipment or drink the same sports drinks. The global sports market in 2013 alone was estimated to be worth over $130 billion. Athletes and the wider community are promised that they will jump higher, tackle harder, run faster and score more goals by wearing or using the most advanced products.

At the local level, however, many teams rely on government funding or the local council to maintain their competition and facilities. Finances received by memberships and gate sales maintain most costs, but still many social clubs fall short of meeting all costs. Professionals – for example, physiotherapists, conditioning coaches and often support teams – volunteer their time to local teams.

Going further 4.6

Communicate

'The development of a sport at the junior level should be the main priority for the direction of money or any profit made from sporting events.'

Discuss this statement.

Sponsorship, advertising and sport

Sponsorship and advertising are essential for sporting teams to continue to function in the big-business world of sport. It is a symbiotic relationship that can have interesting consequences.

To make sales, businesses need customers who are aware of their products. Having the right to display a product name on a uniform, a football or a drink bottle is an attractive proposition to businesses, and they are willing to pay to do so. Athletes, in turn, need money to travel, train, buy equipment and pay support staff.

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Figure 4.6 Tim Cahill and Lucas Neill of the Australian Socceroos, 2009

In general, the higher the profile of a sport, an athlete or a team, the greater coverage they receive, and greater the interest from sponsors. This helps these sports to meet their large expenses, like paying for venues capable of seating thousands of spectators. While this tends to lead to a growing awareness and interest in the sport, the same cannot be said for less popular sports. With little opportunity for media coverage, there is less attraction for sponsors and advertisers, and a vicious circle can develop where these sports may go into decline.

Sponsors are careful to select athletes or sports that represent particular images that they want to convey. They are happy to be associated with the positive aspects of the player or team, but may withdraw support if there is disreputable behaviour that may damage their reputation. Sponsors particularly expect high-profile athletes to act in a manner that will represent the sponsor in a positive light, and this can sometimes lead to pressures that athletes are not able to live up to. Athletes are therefore increasingly required to perform in the social arena as well as the sporting arena.

There are particular and specific reasons why a company will sponsor a sport. First and foremost, a company is seeking greater publicity and awareness of their brand to create loyalty and reinforce their image. The promotion of their business will stimulate sales and allow for greater display of their products in the sport. Companies also rely on their affiliation with the sport to build a positive image and promote goodwill in the community.

There is, however, a downside of this 'free' support for sport from businesses. There are consequences for contracts not upheld by players and/or clubs to service a sponsorship deal. The increased pressure to perform and succeed often hangs by a thread if poor performance occurs. Often athletes are involuntarily endorsing a product from the sponsoring business, even if there is a conflict of interest for the athlete. This is highlighted significantly if the business or sponsor receives negative publicity or is involved in a public scandal. The contract serving a sponsorship may also require a specific time commitment that may place pressure on an already full timetable for an elite, full-time athlete, a coach or a team.

Sport may also be subjected to sponsors' expectations to be category exclusive, allowing no other sponsors an affiliation. Specifically, a sponsor may demand the greatest amount of broadcasting, signage, participation in retailer promotions and advertising in program books.

The economics of hosting major sporting events

All countries that strive to host a successful major sporting event must commit to a considerable amount of organisation before, during and after the event to ensure success. Many countries will establish organising committees to ensure all details are thoroughly accomplished. Think about the effort required to bid for the Olympic Games, the cricket Ashes or a Rugby Union or soccer World Cup.

To bid for an Olympic Games, an aspiring country must address certain criteria. They must ensure that they can cater for the size of the event – that is, that the city has enough stadiums for all events. The city must be big enough to accommodate and transport all athletes, tourists, journalists, politicians and other interested parties.

Going further 4.7

Create

1 **Write a journal entry from the perspective of an athlete: You are striving to receive any form of recognition in your sport and have conflicting views/beliefs to the company that is offering you sponsorship. What hurdles do you face? How do you feel having to be seen endorsing particular products?**
2 **You are head of major company. What product do you sell? Who or what sport would you choose to endorse it and why?**

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Figure 4.7 Piccadilly Circus, London

Positive exposure about the event must be provided in the media from the bidding city. Attention to medical facilities and environmental impacts is also required to ensure no negative after-effects. The cost to the bidding city of an Olympic Games is estimated to be around $25 billion; however, this is a conservative figure.

The strain of bidding for this major event came under scrutiny after the 1976 Montreal Games ran into a huge financial deficit. No country was bold enough to bid for the 1984 games except the United States. Its impressive marketing impressed audiences and resulted in a profit for the host city of Los Angeles. The Olympic Committee developed the Olympic Partner Program (TOP) in response to this success. The TOP is a marketing agreement by 12 sponsors of the Olympic Games who offer lucrative sponsorship, as outlined in an agreement with the Olympic Committee. The sponsors receive worldwide publicity for their contribution to the Games.

Going further 4.8

Create

You are a member of the International Olympic Committee. Explain why the committee chose Sydney for the 2000 Olympic Games. Elaborate on your response by considering an evaluation of the impact of the Sydney Olympics on:

- **the people of Homebush**
- **unused facilities**
- **the economy of Sydney and New South Wales.**

Consequences for spectators and participants

The commodification of sport has benefited many organisations, individual athletes and the sporting public. This has led to increased coverage and accessibility of sporting events, along with changes of rules to increase excitement for spectators. However, some commodification has been detrimental to sport.

The following lists highlight the positive and negative consequences for participants (players) and spectators.

Positive consequences for players/participants

- Skilled players can earn high incomes in short periods of time.
- Endorsement contracts can increase player income.

Benefits of hosting an event	Costs of hosting an event
Build tourism for the city	Economic: infrastructure required to host event, for example, new Olympic village, new sports arenas, transport systems
Economic influx	Host country's capacity to host event
Display pride in city and country	Threat of terrorism and associated security costs for city
Eagerness for international spotlight	
Image for city/country as a global player	
Opportunity to bring new jobs for a community	
Increased funding for sports development for athletes at both the elite and beginner levels	

Table 4.1 Benefits and costs of hosting a major sporting event

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The economic impact of the 2012 London Olympics

Every four years, another city plays host to the Summer Olympics. To prepare for the sporting events, the multitude of international guests and countless television viewers, the host city must spend a large sum of money on facilities, transport infrastructure, housing and maintenance. Historically, most cities make a loss on their investment in the games, but some have come out on top, so, as London prepares to host the 2012 Olympics, we are wondering how the city will fare. Let's see how the cash is being splashed and whether or not we'll see any of it in return.

Olympic budget: Who is paying for the 2012 Olympics?

Who?	Amount contributed
The Central Government	£5.975 billion
National Lottery	£2.175 billion
Greater London Authority	£925 million
London Development Agency	£250 million
Total	£9.325 billion

Table 4.2 Olympic budget

What's the money being spent on?

What?	Money spent
Core Olympic costs (venues, transport infrastructure, site security and program management)	£3.081 billion
Infrastructure and regeneration	£1.673 billion
Contingency	£500 million
Other (non-ODA)* Olympic costs	£388 million
Policing and wider security	£600 million
Tax**	£836 million
Program contingency (changes in statutory requirements [environmental protection and health and safety], unforeseen ground conditions and potential increase in the cost of security and construction)	£2.247 billion

Table 4.3 Olympic expenditure

That's £5.906 billion more than the projected budget when London made the bid to host the games in November 2004.

*Olympic Delivery Authority: The organisation responsible for ensuring that all venues and infrastructure are delivered for the 2012 Olympics

**'Following HM Treasury confirmation that the Olympic Delivery Authority would be unable to reclaim VAT, tax liabilities of £1173 million were included in the March 2007 budget (£8.36 million included in figure above, plus £337 million within the program contingency) – House of Commons Committee of Public Accounts.

Positive economic impact

Although spending is higher than originally anticipated, there is good news: the 2012 Olympics are expected to give a nice boost to the British economy.

Area	Economic impact
Increase in consumer spending	£750 million
Increase in economic output	£1.14 billion
Increase in UK residents' incomes (from increased wages, profits from home rentals and increased demand for output and services)	£229 million

Table 4.4 Immediate economic impact during the seven-week games period in London

Area	Economic impact
Total stimulus for the economy	£5.1 billion
Increase in economic output per year	£1.37 billion
Additional income for UK residents per year	£296 million
Percent of overall expected growth of the national economy	3.5%
Additional jobs per year	17,900

Table 4.5 Long-term economic impact of the London Olympics from 2012 to 2015

During the seven weeks of games, international visitors will spend an estimated £709 million in the United Kingdom – that's 18 per cent more than if the games were not taking place.

After the Games are over, the Olympic Park will be redeveloped to provide 8000 homes and 2800 flats.

Lloyds TSB predicts that the London Olympics will generate £10 billion in revenue for the British economy as a whole.

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The economic impact of the 2012 London Olympics

Consumer spending breakdown

Area	Amount of consumer spending
Airlines	£16.3 million
Car hire	£14.7 million
Cash	£199 million
Entertainment	£77.5 million
Food and drink	£4.0 million
Health	£4.8 million
High street retailers	£184.8 million
Hotels	£122.6 million
Insurance	£2.7 million
Miscellaneous	£24.1 million
Motoring	£3.3 million
Petrol	£7.7 million
Supermarkets	£79.9 million
Travel	£8.7 million

Table 4.6 Breakdown of the £750 million increase in consumer spending

Sources: see www.cambridge.edu.au/hscpdhpe1weblinks.

Going further 4.9

Create

1. Write an application letter/marketing sales pitch to a sporting company to convince them to sponsor a lesser known, non-mainstream sport.
2. 'The money outlaid to host a major sporting event could be better spent on addressing inequalities within the particular bidding city/country.' Discuss this statement.
3. Investigate case studies of various sports to see how they have adopted a business focus. Identify the consequences associated with this change of direction.
4. Assess the various consequences of a sporting organisation running itself as a business, where sport is the commodity.
5. What are the economic implications of the nation hosting an Olympic Games?

- There is a higher level of competition for athletes: national and international competition.
- Athletes can travel the world playing the game they love.
- Economic bonuses are paid for winning performances.
- Professional skills are improved, as athletes can train full time.
- Skills and/or knowledge are passed on to younger players through an athlete becoming a trainer or sports commentator.

Negative consequences for players/participants

- Beginner players are placed on short-term contracts with little financial reward.
- Players' private lives become media fodder, and behaviour is subject to codes of conduct enforced by financial penalties.
- Players are expected to adapt to changing conditions, such as day/night games and/or differing country time zones.
- Injury and burnout from increased game frequency and competitive standards are common.
- Salary caps force highly skilled athletes to take salary cuts to remain in a country or play overseas.
- Player trading makes club loyalty difficult to maintain.
- Players are expected to attend sponsors' functions and use sponsors' products.

Positive consequences for spectators

- National/international games create higher quality performances.
- International players are used as drawcards to increase the support base.
- Rule changes increase excitement in games – for example, Twenty20 Cricket, Rugby Sevens.
- There is greater accessibility to games – for example, Day/Night Cricket.
- Merchandising is specific to the team.
- Pre-game and half-time entertainment is provided.
- Technology has increased the viewing pleasure for the spectator – for example, replay, hawk eye, player cameras, hot spot.
- Access to statistics and comparison between performances are available.

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Negative consequences for spectators

- Delayed telecasts risk ruining results before game viewing.
- Favourite players may be moved between clubs due to salary cap restrictions.
- Players are frequently injured due to a heavy playing schedule.
- Traditional uniforms are changed to suit sponsors' logos.
- Ticket prices can exclude some families.
- Ticket demand can be high, so spectators may miss out on major games.

Summary 4.10

1 Outline the development of professional sport.
2 What impact do advertising and sponsorship have on sport?
3 What are the economics of hosting a major sporting event?

Checklist 4.11

1 What are the consequences for sports that adopt a business focus?
2 What are some of the consequences for spectators and participants when sport is deemed a commodity?
3 State one reason why the access to statistics and comparison between performances is a positive consequence for the spectator.

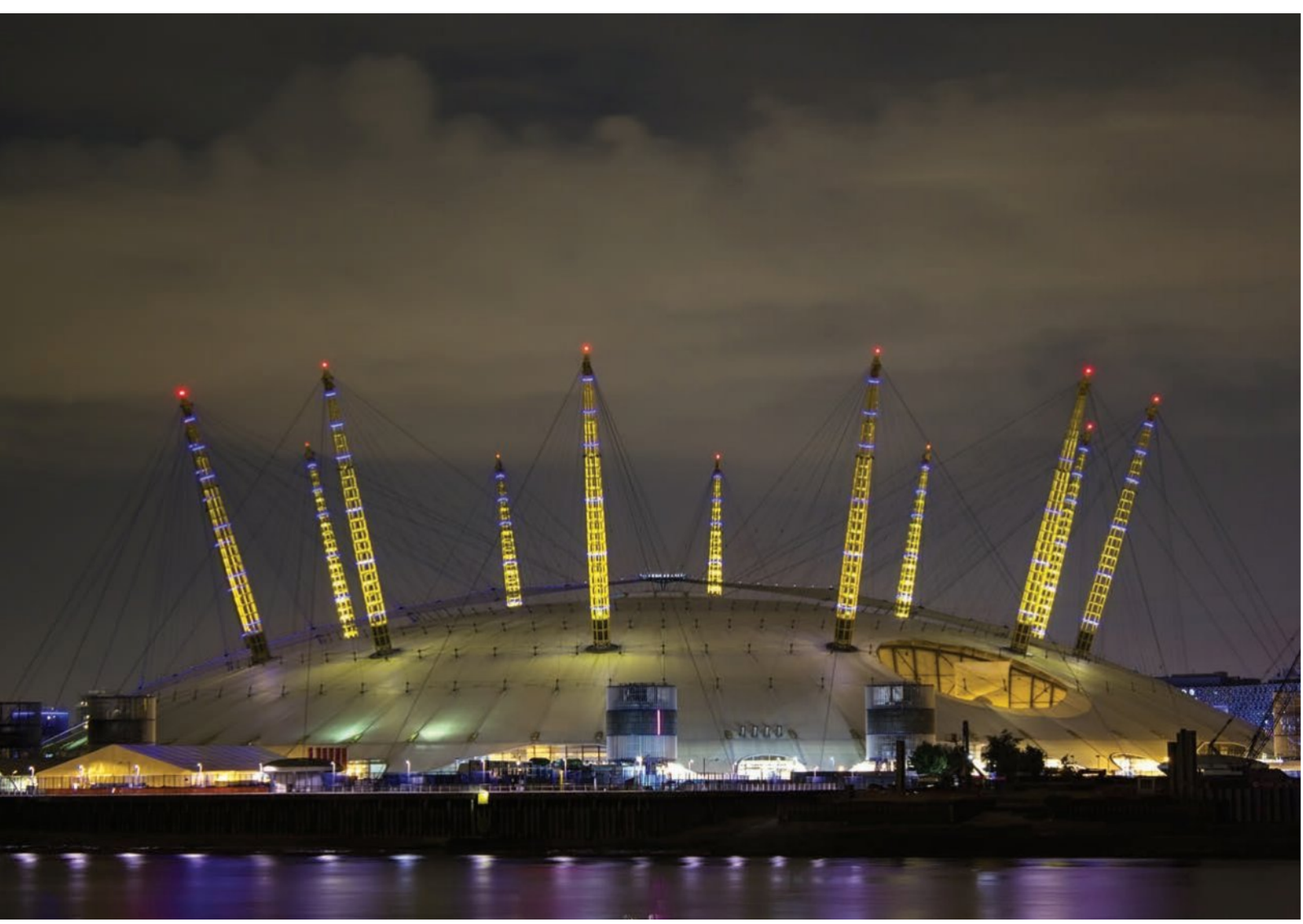

Figure 4.8 Millennium Dome, O2 Arena, London, during the 2012 Olympic Games. The consequences of hosting a major sporting event can be both positive and negative.

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4.2 The links between sport, and national and cultural identity

Australian sporting identity

Driving questions 4.12

1 In what ways is sport a major part of the Australian way of life?
2 How do Australia's sporting performances impact on the general public? Consider how we respond when Australia wins and loses. Does this vary across different locations in Australia?

The growth in Australian sport has enhanced national pride across the country. From the colonial rivalry with the English to that with modern-day superpowers such as the United States and friendly competition with New Zealand, Australia is earning its place on the international stage. The commitment of the Australian Sports Commission (ASC) to develop future champions reflects the sporting passion with which Australians align themselves.

National and regional identity through sporting achievements

Sport is inextricably linked with the Australian image of the tanned, strong, fit individual. The united sense of national pride and a history of sports success has supported the confidence of Australian athletes entering international competition. The encounter of the Australian cricket team in the 1933 Bodyline series paved the way for a true gutsy Australian performance, with the English beaten at their 'own game'. The use of the 'bodyline' tactic, whereby the ball was deliberately bowled at the batsman's body, intimidated the batsman to defend and be caught by close fielding opponents. The poor sportsmanship exhibited by the English left the Australian players wondering whether they were there to actually play cricket.

Australians have an 'underdog' image, used by the media to develop the loyalty of spectators towards the competing team or athlete. The fight for success is characteristic of Australians representing their country at an international level. Often, spectators' national pride is increased if there is a favourable outcome for the competing athlete or team.

National identity is seen in other sporting events where Australians have celebrated winning performances, including the 1999 Rugby Union World Cup final against France, and the Socceroos making the finals of the soccer World Cup in 2006 (for the first time in 32 years). One prominent

National identity: the Olympic Games

No greater sporting event occurs than the Olympic Games. The mention of an Olympics instantly creates a sense of national pride and the opportunity to unify a nation. There are distinct traditions associated with the Olympics that help instil this sense of pride – for example, national teams marching in uniform at the opening ceremony and a country's flag raised during the national anthem for the gold medallist during a medal presentation. The medal tally for each country is used to compare and rate Australia's performance on the international stage. The media hype surrounding the medal tally comparison has greater emphasis than the actual result of a performance. As the Olympic movement uses no formal scoring system, it leaves spectators to make their own judgements about national pride and identity – about which country is 'better' than another.

The media can place unrealistic dreams on the shoulders of athletes who are prospective medal winners. One of the greatest examples of carrying a country's dreams on their shoulders was during the 2000 Sydney Olympic Games. Cathy Freeman ran the 400-metre race with the expectation of gold by all Australians. Her mental and physical exhaustion was evident at the finish line. She had passed the test and given all Australians the result they were hoping and/or waiting for. Other Australians experiencing similar national hope were Kieran Perkins in Atlanta in 1996 during the 1500-metre swimming event and James Tomkins, who competed in six Olympic Games and won his third gold medal at the Athens Olympics in 1994.

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Figure 4.9 The boxing kangaroo is a national symbol of Australia

sporting event evoking national pride was the America's Cup-winning performance by maxi-yacht *Australia II* in 1983, breaking a 132-year winning streak by the United States. The determination and fighting spirit displayed by the Australian yachtsmen earned Australia the boxing kangaroo symbol of the nation's fighting spirit.

Other significant sporting achievements that must be noted as contributing to Australia's sense of sporting identity include Pat Cash winning at Wimbledon in 1987 against Ivan Lendl. His exuberant climb into the stands to celebrate with his supporters remains an enduring image of his success.

The nation's love of the 'underdog' resonates beautifully with the gritty pursuit of Cadel Evans in the 2011 Tour de France. His dominance over the field and finally in the individual time trial earned him the yellow jersey for the penultimate stage. This race is arguably one of the toughest races in the world, making Evans' victory tour a highlight of Australia's sporting achievements.

There is, however, another side to this association of sport and national pride. The push for athletes to carry the expectations of a nation can sometimes result in a less admirable side of sport. Sometimes the devotion to national pride and identity may result in acts of violence in the name of remaining patriotic.

Rural and regional areas

No greater battle exists in sport in Australia than that for supremacy between a team from Sydney and one from Melbourne. Both have traditionally set a code of football as their base, with neither city keen to embrace the other city's dominant football code. Sydney traditionally plays and supports Rugby League, while Melbourne is an AFL stronghold. More recently, there has been increasing spitefulness between the two cities' national A-League, netball and basketball teams.

One must also consider the great rivalry in Rugby League between New South Wales and Queensland, which annually battle it out on the football field for the three-game State of Origin series title. The media catchphrases 'state versus state, mate versus mate' turns the sport into a media and public display of support for one's home state.

A distinctive characteristic of many rural Australian towns is the role competitive sport has played in the community. The sportsperson whose grassroots were planted in the town, and who then ventured on to great achievements, both nationally and internationally, consistently reinforces the close alignment of sport with identity. Australians are familiar with the New South Wales country town of Bowral, the home town of legendary cricketer Sir Donald Bradman. The town now has a museum dedicated to the cricketing legend. Many other rural sportsgrounds are dedicated to local heroes who began their sporting careers in the town.

A sense of hope can also be generated by sport. Working-class communities can use the achievements of talented sportspeople to help them feel a sense of belonging. Newcastle is recognised in sport as a fertile development ground for junior Rugby League. Another city using sport to bring hope to the community is Nambucca Heads on the New South Wales North Coast. There are 17 sports clubs involved in the Good Sports program, which aims to provide positive role models for young athletes.

Government funding

Funding for sport and sports development in Australia comes from the Australian government through the Department of Health. The delivery of the funding in Australia is dictated by the Australian Sports Commission (ASC), which includes as its major focus the Australian Institute of Sport (AIS). The funding aims to provide opportunities for young people and for the elite to pursue their sporting goals.

There are many groups that rely on funding from the ASC. These include:

- National Sporting Organisations (NSO)
- National Sporting Organisations for People with a Disability (NSOD)
- state and territory departments of sport and recreation.

Going further 4.13

Inquire

Read the following article about the Steel City image of Newcastle. What images does it reflect of the sporting nature of Newcastle?

NEWS SPORT BUSINESS WEATHER

Cameron believes Steel will be solid in Sydney

By JOSH LEESON
25 October 2013, 10:30 p.m.

Figure 4.10 Mark Cameron is confident Newcastle will have instant success in the T20 Cup

FORMER first-class fast bowler Mark Cameron believes Newcastle's Twenty20 side have little to fear from their introduction to Sydney grade cricket as the competition is placed on too high a pedestal.

The Newcastle Steel will make their debut tomorrow in the Sydney T20 Cup against Blacktown at Joe McAleer Oval.

It will be the culmination of a long concerted effort from the Newcastle District Cricket Association to be included in what has long been considered one of the world's premier club cricket competitions.

Cameron is the coach of the Steel and will be their front-line bowler during the three-match series plus finals, which also includes games against Sydney University and Sydney.

The 32-year-old former NSW Blues quick spent more than a decade in Sydney grade cricket with Manly-Warringah and Sydney University and is confident Newcastle will have instant success in the T20 Cup.

'To be brutally honest I think if we play proper cricket it doesn't matter who our opponents are – we're going to do just fine,' Cameron said.

'If anything, we put Sydney cricket on too much of a pedestal.

'I played it for the last 10 years and it's certainly not the standard we make it out to be sometimes.'

Besides venturing into the Sydney competition, Newcastle will also be taking T20 cricket seriously for the first time.

The shortest format of the game has been played at club level for several seasons, but tomorrow's match will be the first time the rep side has played T20 cricket in an official capacity.

In preparation, Cameron has given the squad T20-specific training.

'One of the things that we did when we sat down at the start of the pre-season was ask, "Is this what we want to do and how important is it?"' he said.

'We decided early on that it was very important to us, so we've mapped out a very specific T20 plan.

'Every session we've done has been purely focused on T20 cricket.

'I'm exceptionally confident that we're as prepared as any team in the country to play T20 cricket at the moment.'

Source: Newcastle Herald.

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Individual athletes can apply for funding from the ASC. One such program is the Indigenous Sports Program. This partnership between the ASC and state Departments of Sport and Recreation provides opportunities for promising athletes while encouraging Aboriginal and Torres Strait Islander peoples to be more active and play sport at all levels.

The AIS, which is controlled by the ASC, was established after Australia's shocking performance at the 1976 Montreal Olympic Games. It was developed to abolish the tattered sporting reputation of Australia internationally and to enable athletes to excel in their chosen sport. There are currently 35 programs across 26 sports. The AIS allocates funds to:

- international competitions
- elite coaching
- training camps (National Sports Programs)
- intensive training centres
- sports science/sports medicine support
- direct athlete support
- high-performance management
- athlete development
- sports equipment
- athlete career and education support
- talent identification
- sports research.

The strong commitment of the Australian government to improving and extending the nationwide sports agenda is demonstrated through its $330 million worth of financing in 2013–14. Significantly, community participation is being targeted by the government, with $115 million invested into both National Sporting Organisations and programs aimed at equality and diversity. These projects include the Indigenous Sport and Active Recreation Program and the Multicultural Youth Sports Partnership Program. This funding is not limited to the community level, with key 2015 events such as the Cricket World Cup and Asian Cup also receiving government support. Ultimately, these government-spearheaded developments are aimed at preserving the integrity and value of Australian sport.

The ASC is the most important factor in the Australian government's financial support of sporting endeavours. This national body has two main responsibilities: one is maintaining the Australian sports system through management, collaboration and assistance; the other is overseeing government investment in National Sporting Organisations. The Australia's Winning Edge 2012–22 strategy was executed by the ASC in 2013–14. This agenda has been realised through the funding of $169.5 million for high-performance sport, and will emphasise the creation of realisable medal objectives and ensure the able administration of National Sporting Organisations.

Figure 4.11 Podium for medallists at Sydney's Olympic stadium, 2000

Some $120 million in funding was contributed to Australia's National Sporting Organisations in 2013–14 according to the goals set in Australia's Winning Edge. The Olympic and Paralympic sporting system will receive a portion of this funding through a $5 million increase in government grants. Top-tier athletes also received direct support in 2013 as a consequence of the $3 million enhancement of the Direct Athlete Support scheme. This has been implemented through the collaboration of the ASC with the Australian Commonwealth Games Association. This scheme, which benefits world-class athletes, received a total of $11.4 million of funding in 2013–14.

In addition to funding provided by the ASC through the AIS, athletes who wish to compete in the Olympics may be eligible for funding from the Australian Olympic Committee (AOC), which also provides funding to NSOs, athletes and coaches. The AOC does not receive direct funding from the Australian government through the ASC. AOC funding is derived from income distributions from the Australian Olympic Foundation, grants from the International Olympic Committee (IOC), licensing and sponsorship activities of the AOC and fundraising by the AOC, state Olympic Councils and their Corporate Appeal Committees.

The AOC has budgeted $18.8 million to be used to fund the 2016 Australian Olympic Team. It has also budgeted for incentive funding for individual athletes who wish to compete in the 2016 Olympics. Athletes who won medals at the 2012 Olympic Games and who won medals in 2013, 2014 and 2015 at major international competitions in events on the 2016 Olympic program will be eligible for consideration for incentive funding, known as Medal Incentive Funding, in the year after they win a medal. Individual incentive funding amounts from a total incentive funding budget of $4.4 million for the 2016 Games are shown in Table 4.7.

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Athletes			
	Gold	Silver	Bronze
2013	$15 000	$10 000	$7 500
2014	$15 000	$10 000	$7 500
2015	$20 000	$13 400	$10 000
2016	$20 000	$13 400	$10 000

Table 4.7 AOC Medal Incentive Funding

Politics and sports

There is no question about the connection that exists between sport and politics. Many Australian political leaders have expressed great enthusiasm and support for various sports across the country. The association with winners on the sporting field fits nicely into the successful image of a great Australian political leader. Examples include Bob Hawke's ecstatic celebration of the America's Cup win in 1983 and John Howard's passion for cricket.

At an international level, sport has been used as a vehicle for global attention towards inhumane behaviour. The Olympic Games has often provided insight into and evidence of political instability within the host nation. Table 4.8 below gives some examples.

Another major international political collision within sport occurred because of South Africa's apartheid policies. Many international teams, including Australia, boycotted organised tours to the country in response to widespread inequities in human rights. Australian cricketers participated in seven rebel tours of South Africa between 1982 and 1990. The players were not supported by the then Hawke government, but continued with Test and One-day International series games, experiencing mixed success. The International Cricket Council recognises none of the matches in this rebel series. However, in 2007 the cricket tour to Zimbabwe was cancelled by the Australian government in support of an ICC decision deeming the tour unsafe.

Olympic Games	Political climate
1938 Berlin	Germany took advantage, gaining status among European nations with Hitler enforcing his beliefs of racial superiority. Jesse Owens, however, spoiled Hitler's mission by winning four gold medals.
1948 London	After World War II, the political environment excluded Japan and Germany from participation due to their involvement in the war.
1952 Helsinki	Germany participated for the first time, and the Soviet Union returned to the Olympics after a 40-year absence.
1956 Melbourne	Melbourne's Games were not without instability on the international political stage. There were withdrawals from Egypt, Iraq and Lebanon due to invasions of Egypt. The recent invasion of Hungary by the Soviet Union created heated tension in the semi-final match of men's water polo. After ferocious foul play, the game was concluded before further violent action could be taken.
1968 Mexico City	There was volatile global unrest due to the Vietnam War. The racial unrest within the United States was demonstrated when two black Americans gave a Black Power salute and turned their back on the US flag during the national anthem.
1972 Munich	A terrorist attack resulted in the death of 11 Israeli athletes. The IOC president decided to continue the Olympics after a 34-hour suspension of competition.
1980 Moscow	Over 60 nations, including West Germany and Japan, boycotted the Moscow Games to protest at the Soviet invasion of Afghanistan. The boycott was led by the United States. Australia boycotted these games; however, a few athletes defied the government and competed without support.
1984 Los Angeles	Following the Western boycott of the 1980 Games, the Soviet Union led a boycott by 14 nations. It claimed the Los Angeles Olympic Committee was violating the spirit of the Olympics by using the Games to generate commercial profits.
1992 Barcelona	Germany competed under one united flag for the first time since 1964, while post-apartheid South Africa was invited to compete, ending a 32-year ban.
1996 Atlanta	A terrorist bomb exploded in Atlanta's Centennial Olympic Park, killing two people and injuring 110.
2008 Beijing	The outrage from human rights groups highlighted the inhumane treatment of people in the past. There was movement for a boycott; however, this did not eventuate. The civil unrest, health concerns from poor air quality and unpleasant treatment for individuals protesting were bubbling under the surface during these Games.

Table 4.8 The impact of political instability on the Olympic Games

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On a national level, no one can doubt Cathy Freeman's statement during her victory lap at the Sydney 2000 Olympic Games. The carrying of both the Aboriginal and Australian flags highlighted her beliefs and values about her shared Australian culture. She was presenting her identity, with a united heritage, to the world.

The influence of sport on politics is highlighted during election campaigns, and may increase the status of an individual's political influence. Many Australian prime ministers have benefited from their relationship with successful sportspeople and sporting teams. It may help the politician to focus on the success of a sporting performance rather than the economic or social problems they may be navigating as leader of the country.

Politics also occurs at the local club level. Many decisions made by elected board members or coaches may cause conflict or unrest within the club. Financial restraint, the players chosen for teams and administrators' demands all have an impact on the unity of the club.

Summary 4.14

1 How is Australia's identity developed through sporting achievements?
2 How does government funding affect sport in Australia?
3 What role does politics play in sport?

Checklist 4.15

1 How has sport been used to promote national and regional identity? Provide examples.
2 When has Australia used sport for political purposes?
3 What impact has this had on athletes and the Australian public?

The meaning of physical activity and sport to Indigenous Australians

Traditional activities and sports

Indigenous Australians generally have been physically active people. Their nomadic way of life sharply contrasted with the English colonial lifestyle, where sport was a separate part of life. The daily hunting and gathering activities, rituals and ceremonies were conducted wherever the land would lead them, with people often travelling long distances in search of seasonal foods. The entire community would move between areas to conserve the natural resources of an area. Games were played for fun, with no rules, to enable the teaching of practical skills.

Indigenous Australians owned little equipment, making use of their natural surroundings to meet their needs. The games and activities concentrated on developing skills required for hunting and gathering – for example, running, swimming, throwing, fishing, dancing and using teamwork. Some traditional Aboriginal games include:

- **Battendi** – set up to enhance a spear-thrower's accuracy and distance. Points are awarded on both bases, with the target throws making for a particularly entertaining contest. Battendi was played in areas of South Australia.
- **Boogalah** – a game where a ball is thrown into the air. Whoever catches it goes with their entire totem group into a group in the middle, while the others are circling around. The ball is thrown into the air until one of the circles outside catches it. Then both groups change positions. The totem keeping possession for the longest time wins.
- **Brambahl** – two men hold a long rope at each end to swing it. When the rope is in full swing, the skipper enters and performs several activities while skipping.
- **Bubberah** – come-back boomerang throwing. The boomerang that returns closest wins.
- **Buroinjin** – a ball game similar to basketball, played with a ball made of kangaroo skin (called a *buroijin* and stuffed with grass) by the Kabi Kabi people of southern Queensland.
- **Gorri, Wungoolay** – a game in which boys and men throw or roll a small object (a tennis ball or a disc) along a line at a moving target. Players are required to try to strike the moving object with spears from a distance of about 14 metres to score points for their team. This kind of game has historical references to hunting wildlife, and helped children learn about accuracy of the eye and speed in casting the spear, improving physical fitness and focus. It appears to be common to Western Australia and Victoria.
- **Gurril Boodthul** – players in this game throw *boodthuls*, or miniature war clubs, towards a bush. The clubs have to skim through the top of the bush, which accelerates them beyond the bush. The winner is the person whose *boodthul* travels furthest.
- **Kalq** – a traditional Indigenous game where men used a throwing stick (*woomera*) to project

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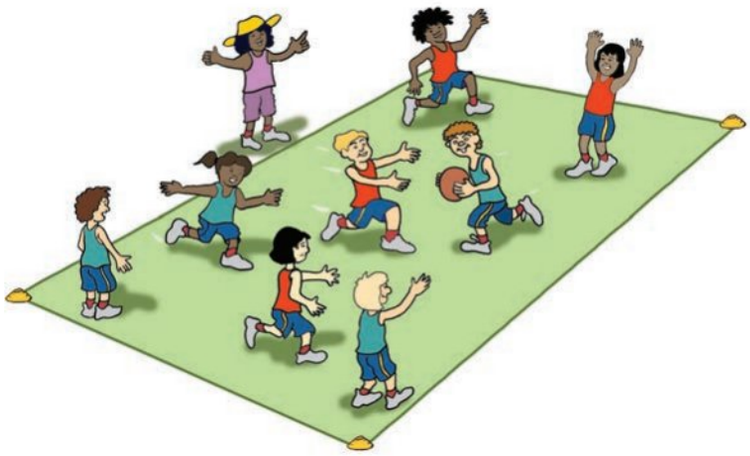

Figure 4.12 Keentan, a running, passing and catching team keep-away game

a big killing spear (*kalq*) towards the next player. They used their woomeras to deflect the spear to the next player. Boys used spears with blunted ends when they played this game. The game is traditional to the Cape York Peninsula in North Queensland.

- **Keentan** – a keep-away game of catching the ball played by both genders. The game was also called the 'kangaroo-play' because the players jumping up to catch the ball resembled the movements of a kangaroo.
- **Koolchee** – a ball throwing and hitting game traditionally played by Aboriginal people in the Lake Eyre district of South Australia. The balls were made of any material that could be easily worked and were the size of bowling balls. Two teams lined up on opposite ends of a dry claypan, rolling their balls to the other end and trying to break the other team's balls. This traditional Aboriginal game ended when almost all balls were used, and takes its name from the word *koolchee* for the balls.
- **Mer Kai** – a ball is kept in the air for as long as possible, similar to hacky sack.
- **Parndo** – a kicking and hand-passing game using a ball (*parndo*) made with a piece of possum skin, flattish in shape and about the size of a tennis ball.
- **Puloga** – like dodge ball.
- **Taktyerrain** – a mock combat game like 'poison ball' or 'brandy'. Toy spears made from grasses, reeds and rushes were thrown, sometimes with a toy throwing stick (*woomera*). Both girls and boys played this traditional Aboriginal game.
- **Wana** – only girls played this traditional game. A short piece of stick was placed on the ground to represent a baby. Each girl had to defend her child from the digging sticks of the other girls. The mother tried to fend them off using her own digging stick (*wana*). Wana taught girls to defend their young children. Sometimes adult women stood by the side of their men to ward off the attack of a rival tribe. This traditional game was known in Western Australia.
- **Whagoo** – a popular hide-and-seek game.
- **Woggabaliri** – a traditional kind of football game that involved a ball made of possum fur, only about 5 centimetres in diameter. The women spun the ball. The game trained players in agility and required suppleness of limbs.
- **Yiri** – a traditional aiming or accuracy game. The general idea is to aim a spear at a moving target, which could be pieces of wood or bark placed in running water. In modern versions, competitors throw tennis balls at a moving tyre.

Source: Creative Spirits (see www.cambridge.edu.au/hscpdhpe1weblinks).

Going further 4.16

Inquire

1 What aspects have influenced a physically active lifestyle for Indigenous Australians?
2 What would sport have meant to Indigenous Australians in nomadic times?
3 What would you have played if you had been alive during this time?

Figure 4.13 The word Marngrook comes from the Gunditjmara (located in the south-western district of Victoria) language and means 'game ball'. Elements of the game of Australian Rules Football (AFL) are believed to have originated from a traditional game that was played with a possum-skin ball. There are various stories that relate that this game was being played in different forms across Victoria.

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Often elders and adults would participate in the games with children, passing down important cultural etiquette and information to the younger members of the community. Dancing was integral to night-time activity, and also used for corroborees and symbolic ceremonies.

Links between community and identity

Each group identity is unique within the Indigenous Australian community, where each tribe or language group is distinct from the next. Traditionally, Indigenous peoples occupied themselves with games and activities that focused on physical survival. Their roaming way of life resulted in everyday survival skills being reflected in the type of play and activities. For example, children would race each other to swimming holes, climb trees as a test of strength, and track and hunt for new places to reside. Boys and girls would often race each other in climbing trees or using the tracking of animal tracks to find their way home.

The concept of sporting teams was foreign to Indigenous Australians. New sports, such as soccer, boxing and cricket, were introduced in the 1880s and 1890s. Indigenous Australians were vastly under-represented in the upper-class sports of golf and tennis during this time.

It is ironic that the first Australian cricket team to tour England was Indigenous, with players impressing with their winning performances. Back in their own country, however, a law was passed that isolated Australian Indigenous communities. In 1869, the *Aborigines Protection Act* prohibited socialisation between all groups in society. This Act remained in place until the 1960s, and did little to progress the Indigenous sporting culture and identity.

The rules of Indigenous people's games were not focused on scoring, with teams made up of extended family members. There were inter-tribal competitions arranged, focused mainly on fighting within a certain boundary. Often these inter-tribal gatherings involved trading and the arranging of marriages.

There are many Indigenous Australians who have excelled in sport and present themselves as role models for their communities. One of the most famous Indigenous Australian athletes is Cathy Freeman, who entered the world scene when she won the 400-metre race at the 1994 Commonwealth Games in Canada. In the elation of her victory,

Ben Harradine	Athletics – first Indigenous field event athlete Discus	Shane Parker	Wrestling
Bianca Franklin	Netball	Sharon Finnan	Netball
Jeff Dynevor	Boxing – first Aboriginal athlete to win a Commonwealth Games medal in 1962	Percy Hobson	Athletics High jump
Joshua Ross	Athletics – winner Stawell Gift 2003 and 2004	Michael Ah Matt	Basketball
Kyle Vander-Kuyp	Athletics – hurdles	Nathan Jawai Patrick Mills	Basketball
Nicole Cusack	Netball – 42 tests for Australia between 1989 and 1998	Chris Collard	Kickboxing
Nova Peris	Hockey/athletics	Paul Rowe	Body-building
Patrick Johnson	Athletics – first Australian to break 10 seconds for 100 metres	Anthony Little Frank Roberts Lionel Rose Ron Richards Wally Car	Boxing
Tony and Anthony Mundine	Boxing	Evonne Goolagong Cawley	Tennis
Lance Franklin Gavin Wanganeen Adam Goodes Michael O'Loughlin	AFL	Eddie Gilbert Bernie Lamont	Cricket
Cathy Freeman	Athletics – 400-metre Olympic Gold Medallist	Sam Thaiday Greg Inglis Johnathan Thurston	Rugby League

Table 4.9 Famous Indigenous sportspeople

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Going further 4.17

Create

1 Choose one of the Indigenous sportspeople in Table 4.9 and put yourself in their shoes. Write a journal entry reflective of a fabulous career, highlighting benefits, trials and pitfalls sport has brought to your life. Use this to investigate how physical activity and sport have influenced the lives and identity of Indigenous Australians.
2 Write a letter to yourself about how things have changed from traditional games and physical activity to modern-day life.

Figure 4.14 Cricketers play in the 2014 Imparja Cup in Alice Springs, Northern Territory

Freeman carried two flags on her victory lap and determined to represent who she was: both Australian and Aboriginal. Cathy Freeman was proud of the role model she became, not only for Aboriginal people, but also for female athletes and all Australians. Her career highlights of lighting the Olympic torch and winning gold in the 400-metre event at the Sydney 2000 Olympics are undeniably great sporting events in Australian history.

Many Indigenous Australians who have become prominent sportspeople have used their sporting prowess to act as role models for Indigenous youth. Players in the AFL and Rugby League codes of football can attest to the difference sport has made in their lives. Table 4.9 highlights some famous Indigenous sportspeople.

Sport and community

Aboriginal people have always played sport. From traditional games to elite athletes, sport has assisted in developing social cohesiveness in many communities. In many communities, sport provides a sense of belonging and a feeling of coherence – something to stand for. It provides meaning and purpose. Michael O'Loughlin was a prestigious AFL player who used sport in a positive way: 'Sport was the first pathway that embraced Aboriginal people and gave them the opportunity to compete on an equal playing field,' he said.

Many Indigenous sporting events occur across Australia each year. Their aim is not only involvement in sport but also to promote healthy lifestyle messages. Other events simply offer a safe, family-friendly environment for fun and physical activity. Examples of these events held in various states and territories include the Aboriginal and Torres Strait Islanders National Basketball Association Championships held in Cairns since 2005 and the Ella 7s Rugby Union carnival, which started in 2009 and is staged in Coffs Harbour. The Imparja Cup is Australia's National Indigenous Cricket Carnival, held each February in Alice Springs, Central Australia. Originally founded in 2001 by custodians Shane Franey and Ross Williams as a family match between Alice Springs and Tennant Creek, the Imparja Cup is now a national celebration of cricket and Aboriginal culture. Charters Towers Indigenous Cricket Carnival (Goldfield Ashes) is the world's biggest cricket carnival, which began in 1948 with just six teams. In 2008, more than 200 teams and about 500 Aboriginal and Torres Strait Islander players competed.

In 2008, plans were drawn up for annual National Indigenous Games, a move initiated by the Australian Indigenous Games Foundation (AIGF), which was founded in May 2008. The games were to alternate between Darwin, Alice Springs, Cairns and Townsville. However, the plans never eventuated and the first games, scheduled for 2010, did not happen.

Summary 4.18

1 Describe the nature and role of physical activity and games for Indigenous Australians prior to colonisation.
2 How has sport linked the Indigenous community and its identity?

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Checklist 4.19

How have physical activity and sport influenced the lives and identity of Indigenous Australians?

Physical activity, sport and cultural identity

A culture is built upon values, beliefs and customs. The importance of physical activity and sport in one's culture will determine the outcome of these activities. Some cultures may value the socialisation competitive activity can bring, while others may appreciate the cooperative and teamwork nature of activities and maintenance of health.

The role of competition

Competitive sport plays an enormous role in the day-to-day life of Australians – hundreds of thousands of people participate in, watch, support and train for competitive sport each week. For many, it is competition itself that provides the motivation to dedicate themselves to their sport. Striving to be the best one can be – and striving to be better than everybody else – are important elements of Australian sporting culture.

Compared with the sporting culture of modern-day Australia, the sporting cultures of other cultures may place less importance on competition as a reason to participate in and enjoy sport. In particular, this is evident in some of the martial arts traditions that have come from Asian countries, such as Wushu and Kendo, where the emphasis is placed on self-development and learning the correct forms. As Western competitive sporting culture – soccer, golf, baseball – has spread across the world, it is important to think about how this has changed the existing sports culture in the countries in which it has arrived.

Links to cultural identity

Australia is a melting pot of different cultures and religions. Sport and physical activity can provide a sense of belonging for people with shared beliefs, values and customs. Many migrant groups have been established in Australia that work to reinforce their own **cultural identity**. Sports often strongly reflect the culture of a migrant's homeland, and are thus an important way for migrants to maintain this connection.

cultural identity a person's affiliation with a particular cultural group

The great rivalry between Australia and New Zealand is evident when the two countries' national Rugby Union teams are competing. The Australians have begun the tradition of having the ballad 'Waltzing Matilda' played as players prepare for kick-off, while the

Figure 4.15 Haka war dance at the Auckland Waterfront for the Rugby World Cup 2011 opening ceremony in Auckland, New Zealand on 9 September 2011

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New Zealand players perform the traditional Maori Haka. Various teams in the A-League have also become famous for their celebratory rituals.

Relationships to health

The relationship of physical activity and sport to health varies across many cultures. Many Western and Pacific Islander cultures view sport and physical activity for the entertainment value and social interaction. Little acknowledgement is given to the holistic nature of health but merely focuses on the physical (how one's body looks and feels) and social (socialisation) components of health. Participating in strenuous physical exercise is perceived to be the way to achieve good health, yet these cultures still suffer the greater rates of lifestyle diseases in the world.

A vast contrast is evident in Eastern cultures. The relationship between physical activity, sport and health is more holistic, combining all the components of health. Activities that focus on one's spiritual and emotional connection with movement are encouraged from a young age, such as Tai Chi. The teaching of Yoga emphasises this holistic nature of health whereby mind, body and spirit are one. This holistic relationship with physical activity has led to the awareness of other harmonious activities such as bikram yoga and pilates.

Summary 4.20

1 What is the role of competition in terms of identity?
2 Outline how cultural backgrounds can affect participation in physical activity.
3 How do physical activity, sport and cultural identity relate to health?
4 How does sport affect ways of thinking about the body?
5 Outline the benefits of a more holistic approach to sport and physical activity, incorporating links between mind, body and spirit.
6 Account for the influence of socio-cultural factors on the participation patterns in physical activity and sport by Australians.

Checklist 4.21

Explore a range of physical activities or sports to determine their cultural significance to particular groups.

Ways of thinking about the body

'The body is a temple.' This statement, which originated in Ancient Greek philosophy, upholds the ideal of movement that enhances physique and skill. The body is a temple to be respected, housing the mind and soul.

The human body has been thought about differently in different cultures, and at different time periods, across different cultures of the world. Some view it as a machine to be worked and fuelled, others as a living organism to be tended carefully. Many physical traditions – particularly those originating in Asia, such as Tai Chi, Qi Gong and Yoga – uphold the importance of balance between mind, body and soul. However, unfortunately in Western society, many media outlets perpetuate an unrealistic ideal of the 'perfect' body that is often unattainable, leading to mental and spiritual anxiety. The perpetuation of unrealistic body types has led to both male and female body dissatisfaction, and seeking cosmetic surgery or muscle-enhancing drugs to achieve perfection. Western nations are also suffering from lifestyle diseases, disordered eating and high levels of physical inactivity. This, in turn, is resulting in serious psychological and physical health issues.

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4.3 The contribution of the mass media to understanding values and beliefs about sport

Imagine a world without mass media coverage of sport. There would be no way to watch the Boxing Day Test after Christmas, the Olympic Games would pass by unnoticed and there would be no footy tipping competitions. Even if we knew the results of games, we would have little idea of the many controversies and personalities that enrich sport and make it interesting.

Mass media communicate information to a large group of people. Australia's mass media consist of television, newspapers, magazines, radio and the internet, including social media, podcasts, message boards, video hosting, RSS feeds and webzines. Sport and the media are interdependent. For example, cricket has reached a new and younger audience through media coverage of Twenty20 Cricket. On the other hand, the media have used sports like cricket to attract money from advertisers.

Driving questions 4.22

Consider a typical sports bulletin in the news and the sports events shown on TV.

1. **What patterns do you recognise?**
2. **What are the reasons for these choices? Do these influence the sports that you follow most closely?**

The representation of sport in the media

The media communicate sporting events and results, but they do not communicate a completely objective account. The information that we receive about sport can be strongly coloured by the media, depending on which aspects of the game are emphasised – whether violence or fair play. The impression that people have of a game can therefore be different from what occurred. Passion can be aroused for particular games, like the Rugby League State of Origin, by presenting it as a battle. This can lead to altered perceptions about issues such as whether violence is acceptable in certain sporting contexts. The media create heroes and villains in sport, and athletes can have an image imposed on them that may or may not be deserved.

The coverage given to the personal aspects of athletes', coaches' and administrators' lives has increased dramatically. Sport is richer for the 'characters' of the game, and some athletes have gained as much attention for their off-field actions as they have for their on-field talent. Public opinion, and the commitment of sponsors, can vary on the basis of which aspects of the athlete's game or personal life are presented.

The media select which aspects of the game to present, ranging from camera angles and sound bites to which players receive the most focus and which material is replayed. This selectivity can mean that a television viewer may have a different impression of a game than a spectator who was there at the ground. A game may be seen to be more or less violent, a player may have been shown to have a larger impact than was the case, or an umpire's mistake may be over-emphasised.

The ways in which society thinks about sport, athletes and their behaviour are closely linked with media representation. This influences not only spectators, but also supporters, sponsors and governing bodies. These perceptions can extend beyond the players and the sport to issues like drug-testing and anti-social behaviour. The media have a powerful role in community reactions to issues like the behaviour of intoxicated Rugby League players by making the issues public so that action is taken. Some clubs, like the South Sydney Rabbitohs, have responded by banning alcohol for players during the Rugby League season.

The mass media attention given to women's sport tends to be less than the coverage given to men's sport, and reflects an attitude that women's sports are not as important as those played by men. Media coverage of women athletes often focuses on their beauty and/or relationship issues rather than their sporting achievements. Tatiana Grigorieva, for instance, was a common sight on television screens during the 2000 Sydney Olympics.

Changes to sporting rules

The media have been influential in changing aspects of sports to suit their needs. Kerry Packer, an important media figure, introduced substantial

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Figure 4.16 Helmet-cams involve the viewer in the game or sport more than has ever been possible

changes to cricket to make it more suitable for television. Visual aspects of the game were emphasised: colourful uniforms were introduced, the ball colour was changed and the game was shortened. More recently, Twenty20 Cricket has taken this a step further, creating a game that can be completed in a viewer-friendly window of time on prime-time TV.

Games that can be tailor-made for television audiences are likely to receive a greater share of viewers, and will therefore be more attractive to advertisers and sponsors, thus increasing revenue. Media coverage of players' personal lives can also lead to a sense of connection among viewers, and social media sites such as Twitter and Facebook give fans an even closer appreciation of athletes and their private lives. Viewers can become more emotionally involved with athletes and more invested in how they perform.

Players now have their names printed on the back of their shirts so television audiences can identify them. Uniforms have become more revealing in sports like beach volleyball and tighter in Rugby Union and Rugby League to show more of the athlete's physique and consequently to attract viewers based on sex appeal.

There are many other changes that have been made to sports to make them more suited to television and the need for predictable timing of programming. These changes include:

- the golden point in Rugby League games
- soccer penalty shootouts
- Friday-night matches in AFL and NRL
- transparent squash courts
- tennis tie-breakers
- scheduled breaks in games like gridiron to coincide with advertisements.

Technological introductions help to create a sense of drama and excitement; helmet-cam, stump-cam, underwater cameras and players wearing heart monitors and microphones all help to involve the viewer in the game. Interesting statistics like batting averages, strike rates and number of wickets can be displayed on screen to involve viewers intellectually, and to provide context for a performance. Television has made expert commentary possible, which gives viewers a greater appreciation of the game. All these combine to make the viewing experience substantially different from what it has been in the past. The introduction of new technology will continue to change the ways in which sports are viewed.

Going further 4.23

Inquire

1 What is the relationship between sport, the media and sponsorship?
2 Rank these three components in order of importance and justify your stance.

Economic considerations of media coverage and sport

Sport is a marketable product. Sales of all sports-related factors increase with finals, big race meetings or international competitions, including the Olympics. There is an interwoven relationship between sport and the media, with each attracting

Figure 4.17 Sir Alex Ferguson, manager of the Manchester United English football team 1986–2013

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money to benefit the other. The most significant area of the media in which sport can generate money is television. Sports can attract extremely large audiences from the most remote locations, and be viewed live even in different time zones. The media have much to gain in terms of advertising revenue and positive reputation from popular sports that bring large viewing audiences. Television networks can receive the benefits of large audiences, as coverage is cheap to broadcast, easy to produce and increases the network's ratings.

Sponsors are attracted to sports with large media exposure. Sport relies on the media to popularise it and attract sponsorship. The media gain in terms of product exposure and advertising revenue. There are mutual benefits for both the sport and the media. Thus the time allocated to broadcasting a sport will reflect the popularity of that sport. Many viewers are attracted to night-time sports viewing, and thus a number of sports are played at this profitable time. An example of this is Friday Night Football in Rugby League. All League fans know that there will be games on Friday night, and often eagerly anticipate them. Advertisers and sponsors pay large amounts of money to advertise during this time, as they know they will have a sizeable audience. The potential to reach so many customers is very appealing to these companies.

Summary 4.24

1. Why do the media use metaphors in their coverage of sport?
2. Explain the media's role in the emergence of extreme sports.
3. Outline ways in which a sport has been modified to suit the media.
4. You are in a business meeting, about to sign a billion-dollar contract for the rights to all sports coverage for the next decade. You must report to your board of directors about the following information:
   - Which sport will receive the greatest coverage and why?
   - How will you influence the future understanding of sporting events with your media power?
   - What rules may change in the future as a response to sports coverage and covering costs of broadcast?

Checklist 4.25

1. Who benefits from the mass media's involvement in sport, and how?
2. How do the media influence our understanding of sporting events?
3. How have sports been changed to suit the needs of the media?

Television networks have agreements regarding which sports they can broadcast. The length of the viewing time for the audience is often much greater than the actual length of playing time. Many broadcasters have produced specialised television shows to highlight, package up and explore issues surrounding the sport during previous games, and in the lead-up to the new schedule of games. *The Footy Show*, *The Cricket Show* and *The World Game* are specifically geared towards providing commentary, interviews, previous player expertise and replays, adding to the time supporters remain watching. This in turn creates greater sponsorship opportunities for business.

Sport is 'sold' to its consumers. It is now both a business and a form of entertainment. The change of playing uniforms is reflective of the entertainment value added to sport. Many uniforms have been given colour or graphic appeal to gain more viewers. Beach volleyball is a prime example of this. The men wear shorts and singlets; however, women are required to wear a lycra top and briefs, with the side of the briefs to be no more than 7 centimetres in width. These uniform regulations

Figure 4.18 Sponsors are attracted to sports that garner large media exposure

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were introduced in an attempt to give the uniform a 'sexier' style, and increase the number of people interested in watching the game, generating more ratings for the television networks. This has led to greater sponsorship of female athletes, yet this is one sport in which the interest in male players does not equate to that in females.

Deconstructing media messages, images and amount of coverage

Difference in coverage for different sports across various print and electronic media

The media as a commodity use athletes. The ways in which a sport is covered by the media directly influence the success of that sport. Games can be seen on television; audiences can watch expert commentary on past performances or preview games about to occur; results can be downloaded on mobile phones; or an entire magazine dedicated to a particular sport can be purchased. What happens, though, if your sport is not considered to be part of the mainstream, or you want to watch your favourite women's team compete? Are the same opportunities available?

The amount of coverage across all print and electronic media will directly impact how successful a sport can become. Sports that receive little interest do not represent viable business opportunities for sponsors, and therefore will receive little media coverage. The sports outside mainstream popularity, with little media coverage, convey the message that they are not as highly valued as sports with greater media coverage. This creates a severe disadvantage for these sports.

The media's first responsibility should be to provide a balanced perspective, but often a certain viewpoint is highlighted, distorting the truth to satisfy public opinion. For example, the violent behaviour that sometimes occurs at football matches is highlighted in the media, and the impression is given that only hooligans whose intent is rioting and causing mischief attend the games, when the majority of spectators at a match are law-abiding fans.

The second responsibility of the media is to debate social issues. Some topics already extensively presented and debated are the use of drugs in sport and the future of the Olympics. A sensible decision must be made concerning these issues, and thus the media coverage must be without bias so the public can support an achievable solution for all involved in sport.

The media often conform to society's expectations of masculine and feminine descriptions when they report on male and female athletes. Males have phrases and metaphors associated with their performance that reflect courage, determination and power. For example, males may have experienced a 'tough encounter' or produced a performance with 'awesome displays of strength', or even engaged in 'war' during a football match. These images reinforce the 'manliness' characteristics of sport. For females, however, metaphors reflect the aesthetically pleasing movements of a performance or overall appearance. There is little association with the determination and prowess associated with outstanding athletic performance. This coverage cements certain ideas of masculinity and femininity – males are strong, aggressive and competitive, whereas females are aesthetic, peaceful and stylish.

The differences in coverage across many sports are most obvious when one examines print and electronic media coverage of women's sport. This reinforces the values upheld in society of males and the sports in which they are involved, which are of higher worth than the devalued and marginalised values associated with women and sport. The coverage of women in sport in the media is a cycle that will require media management to break.

The sport most played by women in Australia is netball, yet the coverage of netball in the print and electronic media is minuscule. Netball is broadcast on free-to-air television; however, the timeslot allocated to the sport is Saturday afternoons, when the potential for viewers who love the game would be minimal as many are out playing in social competitions themselves.

On the rare occasions that women's events are covered by the media, this only occurs if the broadcasters perceive it to be worthwhile. The netball Test matches between Australia and New Zealand can attract more potential viewers than a Rugby League or Rugby Union game.

The continuing argument for less coverage of women's sport reflects the values of society that women are just not as good as men at sport, when people want to hear and see the best sporting performances. However, female athletes are forging forward to break down these strongholds, with many high-achieving performances by teams and individual athletes. At the 2004 Athens Olympic Games, the female swimmers were more successful than their male counterparts. Similarly, in Beijing, Australia took home 46 medals: the men won 22 (48 per cent) and the females won 24 (52 per cent).

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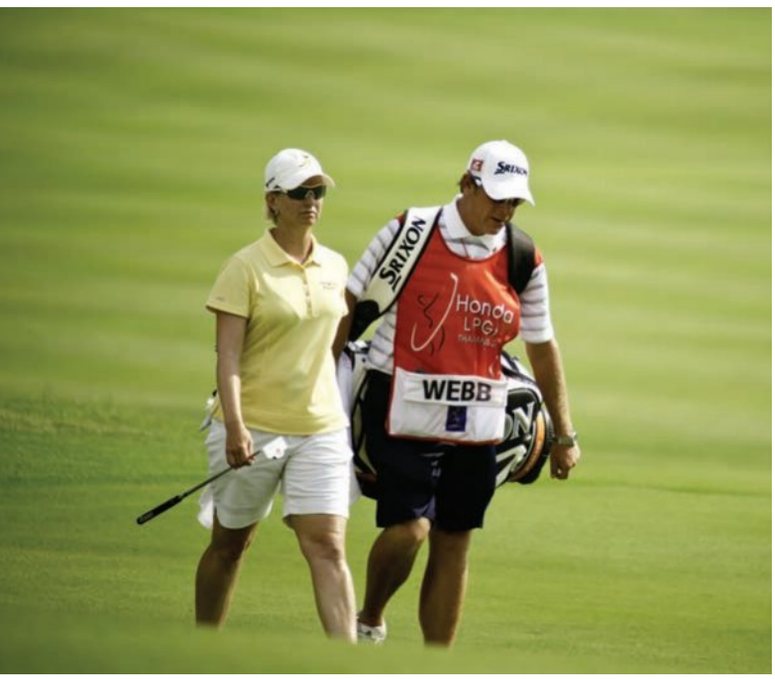

Figure 4.19 Golfer Karrie Webb of Australia during the final round of the Honda LPGA in Thailand on 19 February 2011

Female athletes who have outshone their male equivalents in sport include golfer Karrie Webb, winning more major championships than any male golfer, and basketballer Lauren Jackson, who has achieved international fame, playing in the US Women's National Basketball Association (WNBA) competition successfully for many years.

When women's sport does receive recognition by the print and electronic media, it does not often appear in a prime position – for example, a mid-week newspaper – with fewer stories published than for male sports. Often the pictures coinciding with a story will be about a glamorised athlete rather than showing the sporting excellence that earned the media attention in the first place.

The media appear to be more focused on ratings and selling papers than the messages they are sending out to the nation and future generations. Just 9 per cent of Australian sports reporting is focused on women, while 81 per cent of coverage is dedicated to male sports. Results from a study by the International Sports Press Survey in 2005 show that only 2 per cent of the stories written by male journalists are about female sports. The coverage and commentary of women's sports at the Olympics must equal that for their male counterparts. The major network covering the Olympic Games in 2012 still failed to promote equity, with only one woman, Leila McKinnon, included in the commentary team (see article on *The Roar* website: go to www.cambridge.edu.au/hscpdhpe1weblinks).

The danger faced by women's sports media coverage is the use of sex appeal to market females in sport. This is known as **sexploitation**. The attention given to women's sport takes the focus away from athletic performances and prowess, and focuses on their body type and attractiveness rather than the qualities that define someone as an athlete. There have been some women's sporting teams that have used their sex appeal to gain wider media coverage using non-sporting events.

sexploitation forms of marketing, promotion or attempts to gain media coverage that focus attention on the sexual attributes of female athletes

This creates an ironic situation for elite athletes. In order to attract media and sponsor interest, many female athletes resort to marketing themselves or their sport for their voyeuristic potential. Thus it is essential for women with great athletic performances to reinforce a widespread corporate sponsorship of their sport to add value to their sport and performance, and thus receive benefits deserved from sponsors. The choice of who is represented in the media, and how, creates messages that reflect which sports and groups are valued by society.

Going further 4.26

Inquire

Access a newspaper (preferably a Monday edition). Do a statistical analysis of the number of sports articles, considering the following factors:

- **types of sports**
- **gender.**

The emergence of extreme sports as entertainment

When a sport is labelled 'extreme', it generally means there will be a high element of risk involved. Some of these sports have existed for decades, such as ice climbing, rock climbing and surfing. Modern extreme sports now include many high-risk activities that push athletes outside their comfort zone, pumping adrenaline through the body. Some examples are base-jumping, cave-diving, kite-surfing, street luge and snowboarding.

The main difference between traditional and extreme sports is the level of danger involved, and consequently the adrenaline generated by the experience. All athletes know the risks and adrenaline-pumping nature of playing Rugby Union, but the context of play is not impacted by high speed, stunts or a changing environment. Extreme

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sports push boundaries beyond traditional realms, and often attract sportspeople who do not conform to customary images of the modern athlete.

The younger generation is particularly drawn to this style of sport. The rejection of traditional sports is evident across this social demographic, as is a desire to reject authority and engage in an adrenaline-fuelled adventure. The younger generation of today is now choosing this style of sport, leaving behind traditional sports in increasing numbers. The attraction of extreme sports is the uncontrollable variables within the natural environment such as wind, rain and snow, and the terrain. Examples of such sportspeople include snowboarders and big-wave surfers.

The rise and development of extreme sports has not gone unnoticed by the media. The attraction of adrenaline junkies pushing themselves to perform not just big stunts but huge stunts is behind this new sports category. New footage loaded on to the web becomes viral within hours, as the online demand for entertainment is established. People can become internet celebrities overnight, empowering untrained 'athletes' to perform more dangerous stunts/activities to meet the viral demand.

The use of technology can enable spectators to watch in the comfort of their own home or a stadium seat while handheld and helmet cameras capture footage. The 'GoPro' has exploded as a must-have tool for teenagers to capture their extreme sporting activities.

Television networks realise the benefits of creating close relationships with extreme sports. The delivery of exciting television enables the media to broadcast events without massive overhead costs and with fewer people involved – all lowering costs and providing an entertaining sport to fill gaps in traditional sports coverage.

The creation of the *X-Games* has been in response to the demand for competition in the extreme sports of BMX, skateboarding and motorbike riding. The huge following worldwide has sponsors bending over backwards to have

Figure 4.20 X-Games, California, 2011. The X-Games fulfil demand for sports competitions showcasing the extreme sports of BMX, skateboarding and motorbike riding.

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Figure 4.21 Extreme sports have become a lucrative form of entertainment

Going further 4.27

Create

You love extreme sports. You are to design a mission statement that will be presented to the development team for the Olympic Games in the hope of including extreme sports in the Olympics in the future.

You have three minutes to 'wow' the committee regarding how extreme sports will benefit and bring the games to a new and younger audience.

their names associated with such an event. It should be noted, however, that the rush to give extreme sports a high media profile may present consequences for traditional sports that do not fit the extreme label, as they may suffer from little or no recognition.

Nonetheless, there are pressing issues pertinent to both media and audiences regarding the responsibility of extreme sports. The demand for greater performances must result from greater risks being taken. No longer are single or simple stunts acceptable: difficult, dangerous stunts have become the norm. The unruly nature of this sport directly reflects its self-regulatory nature. Athletes can, however, gain extreme sports insurance. The most difficult risk to guard against – physical injury – remains the most controversial aspect of this sport. The 2013 Winter X-Games saw a competitor lose his life; however, the snowmobiler's fatality was the first for decades in this sport. The response by society to this event is also open to question: it increased exposure and publicity for the sports/athlete's sponsor.

Figure 4.22 Difficult, dangerous stunts have become the norm in extreme sports competitions

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Summary 4.28

1 Discuss the differences in coverage for various sports.
2 Outline the reasons for the emergence of extreme sports as entertainment.
3 The mass media can make or break an athlete by the way they choose to represent them. Discuss, using examples to support your answer.

Checklist 4.29

1 How does coverage given to particular sports reflect which sports are valued and which are not?
2 What metaphors are common in sport?
3 Have the media pushed extreme sports to take excessive risks?

Figure 4.23 One of the more unusual extreme sports events is Snowmobile Freestyle

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4.4 The links between sport, physical activity and gender

Sport as a traditionally male domain

As discussed previously, sport is traditionally viewed as a male domain within Australian culture. The direct relationship between sport, physical activity and gender is something for society to consider as it changes and meets new challenges. The ideals of what it means to be male or female are greatly influenced by sport. The media, policy-makers and the ways in which resources are distributed reinforce the construction of masculinity and femininity ideals.

Driving questions 4.30

Consider the role of women in sport.

1. **Do you think women are given equal exposure to men in the media?**
2. **How might an increase in exposure change views about women in sport in the wider population?**
3. **What barriers exist to reversing this trend?**

Sport and the construction of masculinity and femininity

The ideas of masculinity and femininity originate from societal values and sex-role stereotypes that are created over time. From early colonial days, boys were involved in rough and tumble physical activity preparing them for life and war, whereas girls were involved in gentle activities that prepared them for marriage and having children. The media, in turn, reinforce the ideals of masculinity and femininity in sport today.

The ways in which society uses sport as a catalyst to construct images and ideals of masculinity and femininity have undergone significant change since sport was first introduced to Australia. Traditionally, males used sports as a means to prepare boys for the world through building toughness and resilience, by emphasising strength and power. Females, however, focused on their ability to nurture, and to be passive, obedient and attractive.

Men define themselves by what they do. Within a sporting context, being a 'real man' is a contest of who is strongest, who can take the most pain and who is least feminine. Men are often applauded and encouraged for performances that reinforce these ideas, adding to the masculine culture of 'mateship'. Many Australian spectators and supporters are conditioned to glorify male sporting achievements.

What happens if a boy or man does not fit into this socially constructed mould of what it means to be male? The masculine ideal presented within sport may challenge some male characteristics of individuals who do not fit this image. It may strengthen already existing bias against conformity if they simply do not have the physical build, necessary sports skills or interest in sport. The belief that all males ought to be interested in following and discussing their favourite sport or athlete must consider those who fall outside this construct but still uphold their own masculine ideals.

Society presents an image of what a man should look like, and often males will attempt to develop a physique that resembles this stereotype. Some sports and physical activities demand certain body types, and thus males may undertake unhealthy actions to create the perfect body shape. The prevailing ideas of masculinity dictate that males should be strong, muscular and competitive. From an early age, men learn the accepted body type that is appreciated in society, and whether they fit this stereotype will impact their success and active participation in sport and physical activity. If they do not fit this idealistic form, some males may consider more extreme sports to prove their worth. They may engage in risk-taking sports, which demonstrate their level of courage and manhood – for example, base-jumping.

Females are no exception to society's ideals about femininity. Images of females can lead to behaviours that do not encourage strong athletic performances, but rather encourage soft, clean, tanned and toned rather than muscular. The types of games females are expected to play involve little body contact, with greater focus on aesthetic or coordinated movement. Netball is considered athletic and feminine, whereas basketball has the potential for more deliberate body contact. Young girls may question their own femininity if they are self-conscious about their body or unable to master the intricate moves of gymnastics or dancing. The

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Figure 4.24 More females are participating in sports that traditionally have been considered to be only for males

ability to move beyond a certain level is often dictated by a desired body shape, so participation in these sports may not be considered for females who have the 'wrong' size or shape.

In the early days of sport, female physiques were hidden under clothing. Even when females began participating in more sensible attire, the expectation that they would retain a feminine look was maintained. When swimming costumes began their transformation with the career of Fanny Durack, and revealed more of the female body, one journalist commented that it was pleasing that females were showing no signs of muscles in their backs. Sport and physical activity are integral to the way in which the ideas of masculinity and femininity have been formed.

The construction of masculinity and femininity in sport can be reinforced by the values of families and the encouragement of children to participate in certain activities. When children make sporting choices to participate in activities that differ from societal expectations, they may experience criticism or lack of support. Females playing Rugby Union or male dancers differ from the 'norm'. These choices do not reinforce the notion that boys should be involved in tough, aggressive sports and females in aesthetic-type sports. The attributes required to participate in ice skating, ballet and diving – concentration, cardiovascular fitness and strength – do not possess the prerequisite manly attributes of mateship, aggression and team sports.

The narrow societal expectations that exist concerning sport, physical activity and gender are being challenged each year. Females are participating in sports that traditionally have been considered to be only for males, and there are increasing numbers of gender-neutral competitions as well. Touch football and many indoor sports are examples of this. Many parents are also recognising the importance of lifelong physical activity, and encouraging their children to participate in many sports to help build an active, healthy life.

Going further 4.31

Communicate

Conduct a class debate on the following topic:

'The media are directly responsible for how males and females are represented in sport.'

Implications for participation

An individual's participation in physical activity is dependent upon family background, geographic location, past experiences, socio-economic status and genetic ability. By far the greatest factor affecting participation in sport or physical activity is society's attitudes to gender. Society's beliefs about gender directly influence the sports in which individuals may choose to participate. Females may be pressured to join in traditionally 'female' sports like dance, yet they may lack the skills or body type required. They may be more inclined to try more 'masculine' sports, like boxing.

Yet there is a gender-based controversy about females participating in the typically male-dominated sport of boxing. Women who choose to engage in boxing can be subjected to criticisms based on female stereotypes – for example, the need to maintain their attractiveness – or be seen to be encroaching on male domains, or even questioned about their sexuality. Females

Figure 4.25 The narrow societal expectations that exist concerning sport, physical activity and gender are being challenged each year

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in traditionally male sports may therefore try to accentuate their femininity in other ways.

Males are subject to similar pressures. Not all males have the required body type to play Rugby League, for example. Such individuals may not try other sports that they perceive to be feminine for fear of criticism from others, or because of fears of not appearing masculine.

There are also societal expectations about the roles men and women ought to play. For instance, in some countries women are not encouraged to participate in sport at the Olympic Games. When women are expected to stay at home and look after children, there are more deterrents to participating in sport.

Even the kinds of clothing associated with a particular sport can influence an individual's decision about whether to participate in that sport. Some females may baulk at wearing the bikini-style outfit associated with beach volleyball, and some men may find the lycra of bicycle racing to be a reason not to participate.

Summary 4.32

1. How does sport contribute to ideas of femininity and masculinity?
2. If sport is traditionally considered to be a male domain, how does this impact on participation?
3. How equitable are the sponsorship dollars and resources for male and female sports?
4. What role do the media play in the ideas of femininity and masculinity in sport?

Checklist 4.33

1. How does sport reinforce traditional narrow understandings of gender?
2. How does sport challenge traditional narrow understandings of gender?
3. Critically analyse the participation rates of males and females in a range of sports, and offer explanations for the differences.
4. Consider how some forms of activity have traditionally come to be associated with each gender.

Sponsorship, policy and resourcing

Partly as a result of the above reasons, there continues to be fewer women participating in sport than men. However, there is also a lack of policy aimed at increasing the numbers of women in sport.

Female sponsorship

Even when a female is successful in sport, it is often because of non-athletic qualities. Females who have attracted media interest and sponsorship deals have often – although not always – done so because of cultural ideas about feminine attractiveness rather than athletic ability.

Media

Television coverage of sport is remarkably gender biased, despite the success of recent Australian female teams and individuals. Women's sports are not regarded as being as appealing to audiences as male sports, and the bias in coverage probably results from, and exacerbates, a bias in sponsorship and resourcing. There is less incentive for women to be involved in sport, as women cannot attract the same coverage, income or audiences as men. It is little wonder that some women may not see sport as a serious career option.

The media have a powerful role in shaping public perceptions, yet the media also need to be responsive to public demands about what to cover. The relationship of public perceptions and the media is a complex one, but there is opportunity to use the media as a tool to challenge traditional ideas about sport and gender. This could start from something as simple as children's cartoons presenting less stereotyped female characters, but may also involve attention to images and language used in sports coverage.

Policy development

Thankfully, there is increasing recognition that female participation in sport – both at the amateur and professional levels – needs to increase. This can be seen at international, national and state levels.

The International Olympic Committee has a primary goal of increasing the number of women competing in the Olympic Games. The IOC currently requires each national Olympic Committee to generate plans to increase female participation, and it has also established the Women and Sport Commission, aimed at advocating for women's access to sport and leadership roles within sports.

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The Australian Sports Commission has a Women and Sport Unit that aims to attract and encourage ongoing female participation in sport. There are also government policies, such as the Pregnancy in Sport Guidelines, that seek to prevent women being disadvantaged by pregnancy.

At a more regional level, the New South Wales Department of Education and Training requires that girls in school be given the same opportunities as boys to develop sporting skills.

It is to be hoped that political change will lead to improvements in funding and resources to break down the barriers for women participating in sport at every level.

The role of the media in constructing meanings around femininity and masculinity in sport

The media need to promote socially acceptable role models that support existing constructs of masculinity and femininity to satisfy consumer demands. They need to evolve and present unbiased views and equality for each. Rather than presenting females as 'girls' who are less important, less serious and less adult, it is vital for the media to respect women's sport and counteract the stereotypes that exist when reporting on women in sport. Media commentators must be challenged, as they are notorious for pressing men's sport as being the most deserving of attention and scrutiny.

The media must reassure women that pursuing sport for a healthy lifestyle is important, and does not impact their femininity. The reporting must address the performance of the athlete or team, and not focus on the trials of juggling their sports endeavours with family roles and raising children.

Similarly, males should have the freedom to participate in sports that do not define their masculinity, enabling them to pursue other, less traditional sports that require a high level of skill and fitness without impacting their maleness.

As discussed earlier in this chapter, the words and images used in television, articles and commentaries contribute to the construction of femininity and masculinity in our society. Males are seen as competitive and physically adequate, while females are viewed as emotive and soft. The men are engaged in 'battles', whereas the women get coverage for their off-field personal dramas. This is heightened even further with the names given to representative teams for both genders. Male teams are known as the Knights, Storm, Demons, Bulldogs and Warriors, while female teams are labelled the Opals, Diamonds, Flames and Matildas.

The media have the potential to be used as a powerful weapon for challenging society's views of masculinity and femininity in sport. There could be greater coverage of sportspeople competing in less conventional sporting roles. The suggested messages conveyed to young people who are developing their own sense of identity must involve equal and quality reporting of events. This will aid in athletes receiving coverage for their sporting performance rather than their gender stereotype. This does, however, require risks to be taken by the media, as they survive on the back of sponsorship and television ratings.

Challenges to the male domain

The perceived superiority of men in sport exacerbates the boundaries that exist for females who participate in sport, and emphasises the gender construction that still exists today within the sports environment. The shift for females to gain greater, if not equal, representation across all mediums within sport remains a genuine challenge to the ideological construction of society.

The early nineteenth-century discouragement of women in sport began in the form of concerns over the physical exertion, and the 'defilement' of the female body from a figure of beauty to one that was more masculine, due to competitive sport. The notion of females being 'butch' or 'manly' because of their participation in sports has weighed heavily in this male domain. The persistence of females in sport has resulted in social ideologies shifting to an acceptance of women who exhibit great athleticism and skill. The typical colonial sport of cricket was the first to include women. Today, however, many sports across the country that once were considered traditionally male are now heavily populated by female athletes. Sports such as soccer, surfing, cycling, hockey, Rugby Union and rock climbing all now have a healthy participation rate of women.

There is no more contested sport when it comes to female equality than boxing. It was only at the 2012 Olympics that the IOC – controversially – agreed to females participating in boxing as an Olympic sport. The suggestion that women should wear skirts, as a distinguishing feature from male competitors (as all boxers are required to wear headgear) was even encouraged by a few countries. Interestingly, at the 2012 Games, women were required to compete on consecutive days, whereas

men were given a rest day between competition fights. The coverage for the women's gold medal match was scheduled in the afternoon timeslot, whereas the men fought in the prime viewing timeslot in the evening.

Despite the many achievements of women athletes, considerable discrimination in favour of, and domination by, men remains. Within society today, the goal of equal participation by women in sport, including access to the same resources and opportunities enjoyed by men, is still to be realised.

The flipside of the challenge to the male domain is an underlying participation of males in traditional female sports, which is slowly increasing. There are many local community competitions where men-only games and divisions exist. Netball is the dominant sport, but men also play volleyball with the same-height net as women. Yet those brave enough to challenge social stereotypes of typical aggressive and tough male sports can face exclusion and teasing because of their involvement. Males who participate in aesthetically pleasing sports like ballroom dancing, ballet and even cheerleading may have their sexuality questioned or gender affiliation challenged, which acts to reinforce the long-held social stereotypes within the sports arena in today's society.

Checklist 4.34

1 Examine the debate that surrounds the entry of women into traditional male sports, such as Rugby Union and boxing.
2 Compare this with the entry of men into traditional female sports, such as netball and cheerleading.

Figure 4.26 Women's entry into traditionally male-dominated sports can prove challenging, but must be encouraged

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Chapter summary

- Sport and physical activity have been integral to the social development of many countries around the world. Popular spectator sports such as cricket, soccer, Rugby and baseball play an important part in binding together societies around the world.
- The twentieth century has witnessed a great but gradual change in society's attitudes towards women in sport. In Victorian times, social taboo and medical myths prevented women from taking part in any strenuous sport, restricting them to activities such as horse-riding, archery and rifle-shooting. Events such as the 1912 and 1928 Olympic Games (where women participated for the first time, and for the first time in athletic events, respectively) reflected the slow disappearance of these ideas. It wasn't until 1984, however, that women were allowed to participate in the marathon!
- Many sports clubs, and individual sportswomen and men, at all levels of competition, rely on sponsorship to allow them to compete. Sponsors receive advertising in return for their funding. However, sponsors' expectations can restrict athletes and clubs, and occasionally cause conflict.
- Sporting achievements often promote social cohesion, and are an opportunity to build national pride. Examples of this are the first Australian Ashes victory over England, Cathy Freeman's victory in the Sydney Olympics and the Socceroos' participation in the World Cup in 2006.
- Government funding supports sport and sports development at all levels in Australia. The ministry in charge of sports funding is the Department of Health and Ageing, which channels funds to a range of subsidiary bodies including the ASC, the AIS, state sport bodies and national sporting organisations. Through the AIS, individual athletes can also apply for funding.
- Activities and sports have long been a central part of the lifestyle and culture of Indigenous Australians. Many of these sports and activities developed the skills required for thriving in the often harsh Australian environment.
- As a nation of many cultures, sport in Australia often provides a way for people of different cultural origins to reinforce their own cultural identity, as well as being a platform for cross-cultural understanding.
- To a large extent, it is modern media – whether television, radio, newspapers or websites – that drive the relationship between sport and the general population. Australia's passion for sports is reflected in the language used in the media, and individual sportswomen and men often find themselves public figures far more than they would necessarily like. As well as reflecting which sports are popular, the media also dictate to a certain extent which sports we are able to take an interest in – sports not shown on television (for example, many women's sports) find it difficult to develop a mass audience or fan-base.
- Representation of sport in the media plays a large role in shaping society's gender expectations. Everything from uniform choice to the names of sporting teams – such as 'Bulldogs' for male teams, 'Opals' for female teams – and the differing levels of media coverage construct certain ideas about what it means to be a woman or a man. Media organisations have a responsibility to be careful about their representations of gender, to counteract stereotypes and to promote a healthy body image for both sexes.

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Exam-style questions

1. How has the meaning of sport changed over time?
2. Compare the participation of men and women in sport in the nineteenth century.
3. What are the consequences for sports that have adopted a business focus?
4. Examine the relationship between sport and Australia's national identity.
5. Evaluate the impact on athletes and the Australian public of Australia's use of sport for political purposes.
6. How has sport influenced the lives and identity of Indigenous Australians?
7. Examine the role the media have played in changing the way sports are played.
8. Analyse the media's role in determining which sports are valued.
9. Discuss the media's use of metaphors in their coverage of sport.
10. Why has sport traditionally been a male domain?
11. Analyse the participation rates of males and females in sport, and offer explanations for any differences.
12. Discuss why some forms of activity have traditionally been associated with a particular gender.
13. Discuss the entry of women into traditionally male sports. Provide examples.

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Chapter 5 Sports Medicine
HSC Option 3

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

- *the classification and management of sports injuries*
- *addressing the demands of specific athletes through sports medicine*
- *enhancing the well-being of athletes through preventative action*
- *managing injury rehabilitation.*

Key terminology

abrasion
acclimatisation
acute
chronic
conduction
contusion
convection
direct
dislocation
evaporation
fracture
hard tissue
indirect
inflammatory response
laceration
over-use
radiation
RICER
soft tissue
sprain
strain
subluxation
thermoregulation
TOTAPS

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5.1 The classification and management of sports injuries

Ways to classify sports injuries

Driving question 5.1

Choose a sport and name as many distinct injuries as you can think of associated with this sport. What is the worst sporting injury you have seen?

direct sustained through external force

indirect sustained through internal force

over-use sustained due to repetitive tasks

hard tissue bones and teeth

soft tissue muscles, tendons, ligaments and skin

Sports injuries can be classified by the cause of the injury. **Direct** injuries are caused by forces generated from outside the body. **Indirect** injuries are caused by forces from within the body. **Over-use** injuries result from excessive and repetitive force over extended periods of time.

Sports injuries can also be classified by the tissue type damaged. **Hard-tissue** injuries are those involving damage to the bones. **Soft-tissue** injuries include damage to all tissue other than bones and teeth (e.g. muscle, tendons, ligaments, skin).

Direct and indirect

Direct injuries are those that are sustained through a direct external force causing injury at the point of contact with the injured player. The injury can be caused by another competitor or equipment – for example, a cricket batsman develops a bruise on their thigh after being struck by a bowled cricket ball.

Figure 5.1 Direct injuries are common in Rugby Union

Indirect injuries typically involve damage to soft tissues such as tendons, ligaments or muscles of the body through internal forces that exceed the normal function of the injured body part, thereby causing injury. Examples of this could be a sprinter straining their hamstring during the heavy push-off phase of sprinting, or a soccer player rolling their ankle, causing **strain**/damage to the structures (ligaments and tendons) of the lateral ankle.

strain tear that occurs in the muscles or tendons

Soft and hard tissue

Soft-tissue injuries are the most common injuries in sport. Soft tissue includes the muscles, tendons, ligaments, fascia, nerves, fibrous tissues, fat, blood vessels and synovial membranes. A soft-tissue injury is damage occurring to any of these areas – for example, the sprinter straining their hamstring or the soccer player rolling their ankle. Soft-tissue injuries can be **acute** (sudden) or **chronic** (prolonged).

acute sudden injury

chronic prolonged injury

Hard-tissue injuries describe damage to bone, teeth and cartilage – for example, a soccer player is kicked in the leg and breaks a bone.

Over-use

Over-use injuries develop due to overly repetitive or continuous tasks, incorrect techniques/equipment or over-training. The loaded tissue

Figure 5.2 Soft-tissue injuries can be either acute or chronic

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Going further 5.2

Inquire

Complete the table below.

Injury	Classification/s
Cut eye sustained during a boxing fight	
Strained quadriceps	
Shin splints	
Dislocated shoulder while scoring a try	
Broken tibia/fibula	

Table 5.1 Classification of injuries

cannot withstand the repetitive loads being placed upon it, so injury develops. For example, a tennis player develops tendonitis/inflammation in their elbow from practising too many backhands. Stress fractures are also over-use injuries.

Soft-tissue injuries

Soft-tissue injuries are the most common injuries sustained in sport. They occur in ligaments, muscles, tendons and the skin. There are several different types of soft tissue injuries, including

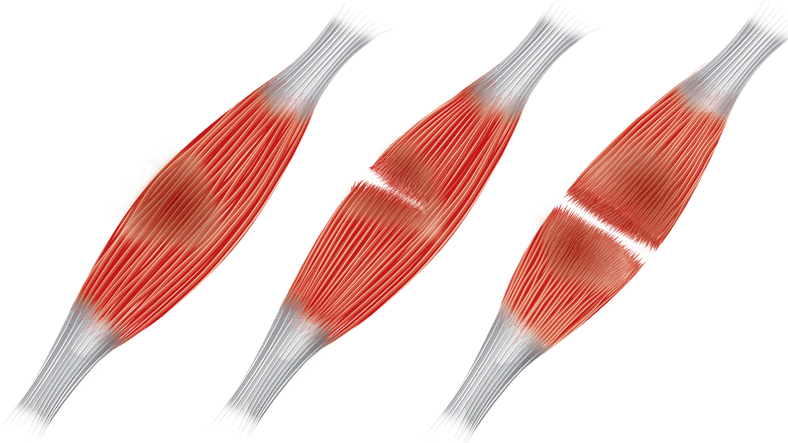

Figure 5.3 Grades of severity of strain and tears in muscle fibres

tears, **sprains**, **contusions**, **abrasions**, **lacerations** and blisters. The healing process for a soft-tissue injury involves the **inflammatory response**, which has three phases.

Tears, sprains and contusions

A tear is damage to a muscle or tendon caused by over-stretching of the muscle fibres, causing some or all of these fibres to tear. Tears are classified according to their severity, with a grade 1 tear being less than half of the fibres torn, a grade 2 tear being more than half of the fibres torn, and a grade 3 tear being all fibres torn – this is sometimes

sprain tear that occurs in the ligaments

contusion damage to the muscle, resulting in internal bleeding/bruising

abrasion superficial skin damage

laceration irregular cut into tissue

inflammatory response natural response immediately following tissue damage

Going further 5.3

Inquire

Using a range of different injuries, classify the injuries into the categories of direct/indirect, soft-tissue/hard-tissue and/or over-use. Complete the table below.

Definition	Example
Direct	
Indirect	
Soft-tissue	
Hard-tissue	
Over-use	

Table 5.2 Definitions and examples of injuries

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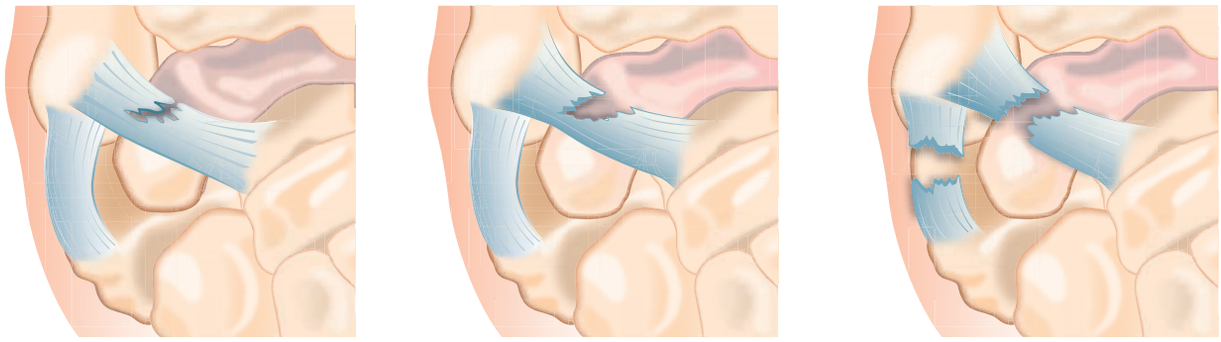

Grade I
Ligaments stretched or slightly torn

Grade II
Ligaments partially torn

Grade III
Ligaments completely torn

Figure 5.4 Grades of severity of strain and tears in ligaments

referred to as a strain. Signs and symptoms include swelling, possible discoloration, bruising and pain.

Sprains are caused when the joint is forced beyond its normal range of motion. A sprain is the same as a tear, though it occurs in ligaments whereas tears are in the muscle. Signs and symptoms include swelling, loss of power, bruising and pain.

A contusion (or cork) is damage to muscle caused by a direct blow to the muscle, resulting in internal bleeding/bruising.

RICER method for treating soft-tissue injuries

The **RICER** (rest, ice, compression, elevation and referral) procedure is the most appropriate way to manage the injury in the early stages.

Figure 5.5 A contusion is another word for a bruise

Skin abrasions, lacerations and blisters

An abrasion is another name for a graze. It is damage to the superficial surface of the skin from scraping along the ground or other surface – usually a hard surface. Abrasions are common in netball, basketball and hockey.

A laceration is a cut into the tissue. It is quite often irregular. Lacerations longer than 1 centimetre need to be referred to a medical practitioner.

A blister is damage to the skin caused by excessive friction, with fluid accumulation beneath the skin as a result.

Skin injuries such as abrasions, lacerations and blisters require cleaning and possibly bandaging.

Inflammatory response

The inflammatory response is the body's natural response, which occurs immediately following tissue damage.

When an injury is sustained to soft tissue, the body's initial response to the damage is to increase blood flow to the area. This new blood is enriched with inflammatory mediators, which are designed to initiate the healing process. This response by the body is often excessive, irritating the surrounding tissues, and actually slowing the commencement of the healing process and causing a temporary increase in swelling and discomfort for the injured athlete. This is why we apply the RICER method to soft-tissue injuries.

Immediate commencement of treatment is required for optimal management of soft-tissue injuries. RICER should be initiated as soon as possible to limit an excessive inflammatory response. This should reduce pain and swelling, further damage to the tissues and overall recuperation time for the athlete following the injury.

The inflammatory response involves three stages:

- acute inflammatory phase
  - usually lasts 48–72 hours
  - pain
  - swelling (causes stabilisation of the joint)
  - redness
  - heat (due to blood pooling)
  - loss of function
- repair phase
  - 72 hours to six weeks
  - inflammation decreases
  - collagen replaces the damaged tissue

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SMARTPLAY

FIX UP

Fix Up
Your guide to injury management

Nobody likes being on the sidelines as a result of injury. The best way to recover from any soft tissue injury is by using the RICER and NO HARM injury management approach. They help to prevent further damage and will mean less time away from your sport or activity.

- The first 48-72 hours are vital in the effective management of any soft tissue injury.
- Soft tissue injuries refer to all ligament sprains, muscle strains and muscle bruises (corks etc) and most bumps and bruises which occur in sport.
- The immediate treatment is RICER.
- RICER should be initiated immediately after injury and continued for 48-72 hours.
- To ensure a successful recovery, NO HARM factors should also be followed in conjunction with RICER.

Rest
Place yourself in a comfortable position. Keep the injured area supported. Avoid using the injured area for at least 48-72 hours as continued activity will increase bleeding and damage.

Ice
Apply ice to the injured area for 20 minutes, every two hours for the first 48-72 hours after injury. Ice reduces swelling, pain and bleeding.
Ice can be used in the following ways:
- crushed or cubed ice in a wet towel or plastic bag.
- frozen pea packet in wet towel.
- cold pack wrapped in wet towel.

Icy or cold water is better than nothing. **Caution:** Do not apply ice directly to skin.

Compression
Apply a firm wide elastic bandage over the injured area, as well as above and below. Where possible hold ice in place with the bandage. Between ice treatments maintain bandage compression. Applying a bandage will reduce bleeding and swelling and also provide support for the injured area. **Caution:** Ensure the bandage is not too tight. Some signs of the bandage being too tight may include numbness, tingling or skin becoming pale or blue. If these symptoms and/or signs develop remove the bandage and reapply again firmly but not as tightly.

Elevation
Raise the injured area above the level of the heart at all times. A pillow can be used to provide support and comfort. Elevating the injured area reduces bleeding, swelling and pain.

Referral
As soon as possible after injury arrange to see a qualified health care professional such as a doctor or physiotherapist. This will determine the extent of your injury and provide advice on treatment and rehabilitation required.

NO HEAT
Applying heat to an injury increases bleeding. Avoid hot showers or baths, saunas, spas, hot water bottles, hot liniment or heat packs.

NO ALCOHOL
Alcohol increases bleeding and swelling which delays healing. It can also mask pain and severity.

NO RUNNING
Running or exercise increases blood flow to the injured site. This can make the injury worse and delay healing.

NO MASSAGE
Massage or the use of heat rubs increases swelling and bleeding.

Early and correct use of RICER and NO HARM factors is essential for the initial management of a soft tissue injury. RICER and NO HARM should be continued for 48-72 hours.

SPORTS MEDICINE AUSTRALIA VicHealth State Government Victoria

The Smartplay program is supported by VicHealth and the Department of Planning and Community Development (Sport and Recreation Victoria).

For further information please contact **Sports Medicine Australia** - Victorian Branch
Sports House, 375 Albert Road, South Melbourne, Victoria 3205

www.smartplay.com.au

Figure 5.6 The RICER procedure is the most appropriate way to manage an injury in its early stages

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  - the structure is unorganised
  - production of scar tissue
- remodelling phase
  - three weeks to 12 months (even two years)
  - organising and uniformity of collagen takes place
  - increased production of scar tissue.

Figure 5.7 A laceration with stitches

Summary 5.4

1 Define and provide an example of a tear, a sprain and a contusion.
2 Define and provide an example of a skin abrasion, a laceration and a blister.
3 Explain the inflammatory response.
4 Analyse why RICER is used to treat soft-tissue injuries.
5 What does 'NO HARM' mean?

Checklist 5.5

Outline the procedure for the management of soft-tissue injuries and the immediate treatment of skin injuries.

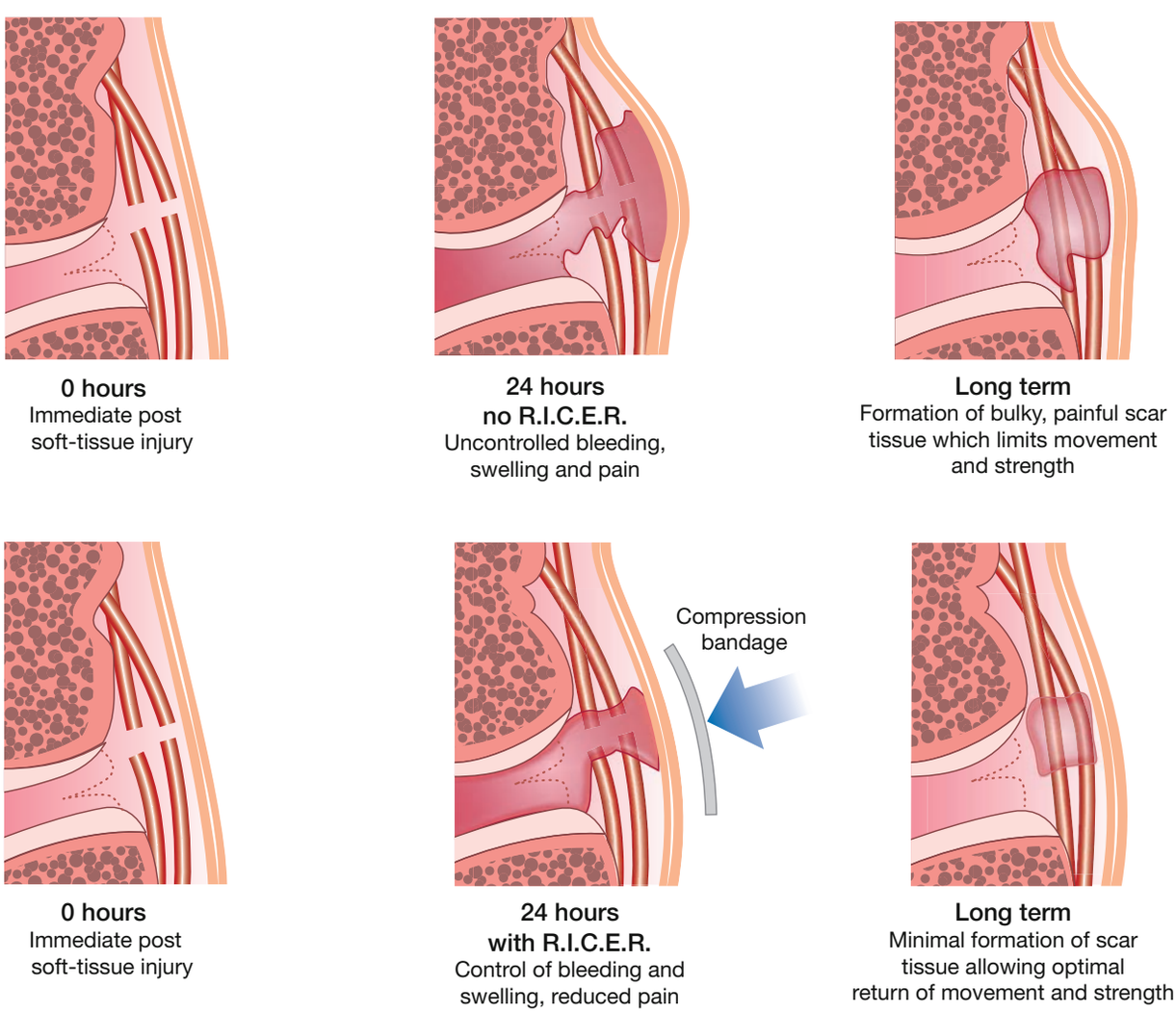

Figure 5.8 The inflammatory response

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Hard-tissue injuries

fracture disruption to the continuity of the outer surface of a bone

dislocation disruption of the alignment of bones within a joint

Hard-tissue injury involves injury to bone. Examples include **fractures** and **dislocations**. Fractures are breaks in the bone, while dislocations are the displacement of a bone at a joint. The key to the management of hard-tissue injury is the immobilisation of the injured area.

Fractures

A fracture is any disruption to the continuity of the outer surface of a bone (periosteum). A bone fracture can be a result of high-force impact, repeated stress or direct impact to the bone. There are three primary classifications of fractures:

- **Simple (closed)** – where a bone is broken but does not break through the skin surface. These can be further categorised into displaced or non-displaced (i.e. moved/displaced from original position or not moved/displaced from original position). These injuries should be immobilised and medical assessment and treatment should be sought.
- **Compound (open)** – where a bone is broken and breaks the surface of the skin, causing an open wound. These injuries require urgent medical attention. Immobilise and gently bandage around the wound/bone to reduce risk of infection.
- **Complicated** – where a bone is broken and causes internal damage to a major nerve, organ or blood vessel. Urgent medical intervention is required. Rest the injured area in the position of most comfort.

Note: management of all fractures involves initial attention to DRSABCD (Danger, Response, Send, Airway, Breathing, Compressions and Defibrillation). If the patient/injured athlete's vital signs are good, proceed to gentle immobilisation of the limb into good alignment (only if required) and call for an ambulance.

Dislocations

Dislocations are a disruption of the two bones making up a joint, with a separation of the bones occurring so that they no longer fit together in good alignment. Dislocations may resolve without external intervention or may require a doctor to put the joint back in place. Dislocations typically cause damage to the structures that stabilise and cushion the joint, such as ligaments, the joint capsule and joint cartilage. You should not attempt to reduce a dislocation if you are not trained to do so. A **subluxation** is the 'popping in and out' of a joint, where it dislocates and immediately returns to normal alignment. Damage to surrounding tissues can still occur.

subluxation a dislocation that immediately realigns

Summary 5.6

1 Summarise the various types of fractures.
2 Explain what occurs during a dislocation. Which type of tissue is generally injured?
3 What is a subluxation of a joint?

Checklist 5.7

1 Outline the management of hard-tissue injuries in terms of assessment for medical attention.
2 Identify the considerations needed when immobilising a hard-tissue injury.

Assessment of injuries

Initial assessment should involve DRSABCD. In most cases, this process can occur quite quickly and the sports medicine practitioner can progress to assessment of the injury.

The **TOTAPS** procedure is the most effective way to assess an injury. This procedure provides information about the extent of the injury and whether the athlete should continue with activity or seek medical attention.

TOTAPS method for assessing injuries

Correct assessment, management and rehabilitation practices are vital to attaining the quickest return of an athlete to sporting participation following an injury. If mismanaged early during the injury-management process, injuries can take significantly longer to heal or may heal inadequately. The TOTAPS procedure (talk, observe, touch, active movement, passive movement and skills test) is an effective method of assessing sports injuries.

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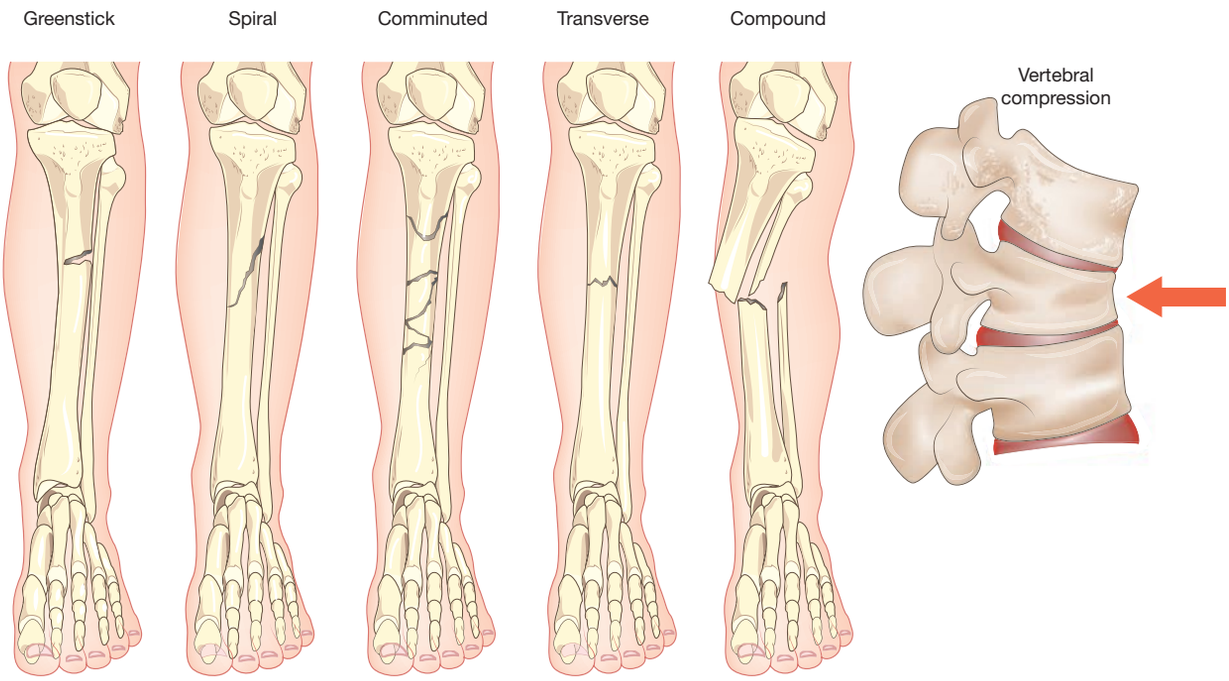

Figure 5.9 Types of typical bone fractures

TOTAPS

- **T** – Talk to the injured athlete to determine what happened, site of injury, abnormal sounds (pop, crack, snap, etc.) and type of pain (sharp, dull, aching, throbbing)
- **O** – Observe the injured athlete for any obvious deformity or irregularities. (*Note*: compare the injury site on left and right where possible.) Also note mental state, consciousness, position of the body, and the pupils and facial expression.
- **T** – Touch the suspected injury area to determine the exact site and severity of the injury. Note any swelling, immediate bruising or deformity.
- **A** – Active movement by the athlete. Assess their willingness to move. Can they move the injured area through the full range? Is there a painful arc in the range?

Figure 5.10 During TOTAPS, observe whether the injured site has any obvious deformities or irregularities

Summary 5.8

Summarise each step in the TOTAPS procedure.

Checklist 5.9

Perform the TOTAPS procedure in simulated scenarios to determine the nature and extent of sporting injuries.

- **P** – Passive movement performed by the trainer. Gently move the joint through the range, noting any pain. Check for instability of any affected joints.
- **S** – Skills test. If none of the above tests rules the athlete out from returning to play, progress to skills tests such as hopping, jogging and any movements that are typical of the activity in which the athlete is participating.

While using the TOTAPS assessment tool, remember that if one level of the test produces significant pain or obviously rules out the athlete from returning to play, you should:

- stop assessment at that point
- remove the athlete from the field of play, if it is safe to do so
- progress to initial treatment of the injury.

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5.2 Addressing the demands of specific athletes through sports medicine

There are three primary population groups that demonstrate unique factors that must be considered to reduce their risk of injury when participating in sports. Through this topic, we will explore common medical conditions/injuries experienced within each group, and devise appropriate management strategies to minimise risk of injury and rehabilitation time. We will also discuss the unique physical needs of each group and examine what level of exercises may be appropriate for them.

Driving questions 5.10

Imagine you have designed a comprehensive training program for a specific individual sport.

1. **Would it be suitable for every athlete?**
2. **What adjustments might you have to make for certain people? Why?**

Children and young athletes

Young athletes and children have unique physical needs and capabilities that require specialised care when they are to participate in sport. These factors are identified in the guidelines set by Sports Medicine Australia in 2008, which outline considerations that must be taken into account when coaching or training young athletes.

Medical conditions

Medical conditions such as asthma, diabetes and epilepsy impact the ability of some children to participate fully in sport. Individualised strategies can often be implemented to ensure that young athletes with health conditions are able to remain safe and active in sporting involvement. It is important for the coach/trainer to consult with parents and devise a team strategy to minimise risk.

Asthma

Asthma is a respiratory condition that is characterised by severe spasms of the airways, causing difficulty in breathing. It usually results from an allergic reaction or other forms of hypersensitivity. Young athletes and children who suffer from asthma have unique triggers that may bring on an asthma attack. It is important to identify what is likely to trigger an individual's asthma attack so that appropriate preventative measures may be put in place. An up-to-date asthma management plan should be maintained for each child. Any person who is associated with caring for/training a child with asthma should have a working understanding of the management plan in case of an attack. If you suspect a child under your care may have undiagnosed asthma, it is vital that you raise any concerns with the parent of that child and advise them to seek a medical opinion. Exercise and medication should be encouraged for all. Asthma sufferers should exercise for 20–60 minutes three to five times a week.

Diabetes

When caring for children and young athletes with type 1 or 2 diabetes, there are special considerations that must be taken into account. They must constantly regulate their blood glucose (sugar) levels to ensure that they remain within normal levels so that they may participate to the best of their abilities and remain safe while playing sport. A management plan should be in place for each child to appropriately rectify high and low blood glucose levels. The coach or trainer of the children must know the management plan for each child and implement it at training where necessary – for example, allowing breaks for blood glucose testing, sugary drinks and insulin if required.

Low blood sugar is also called hypoglycaemia, and is characterised by fatigue, poor reaction times and anxiety. Treatment for this type of episode requires immediate ingestion of high-GI foods such as jelly beans, fruit juice or other sugary foods.

High blood glucose is also called hyperglycaemia, and it is characterised by frequent urination, thirst and drowsiness. Treatment for this type of episode requires access to insulin and therefore medical assistance should be sought.

Exercise can benefit children with type 2 diabetes if it is well managed.

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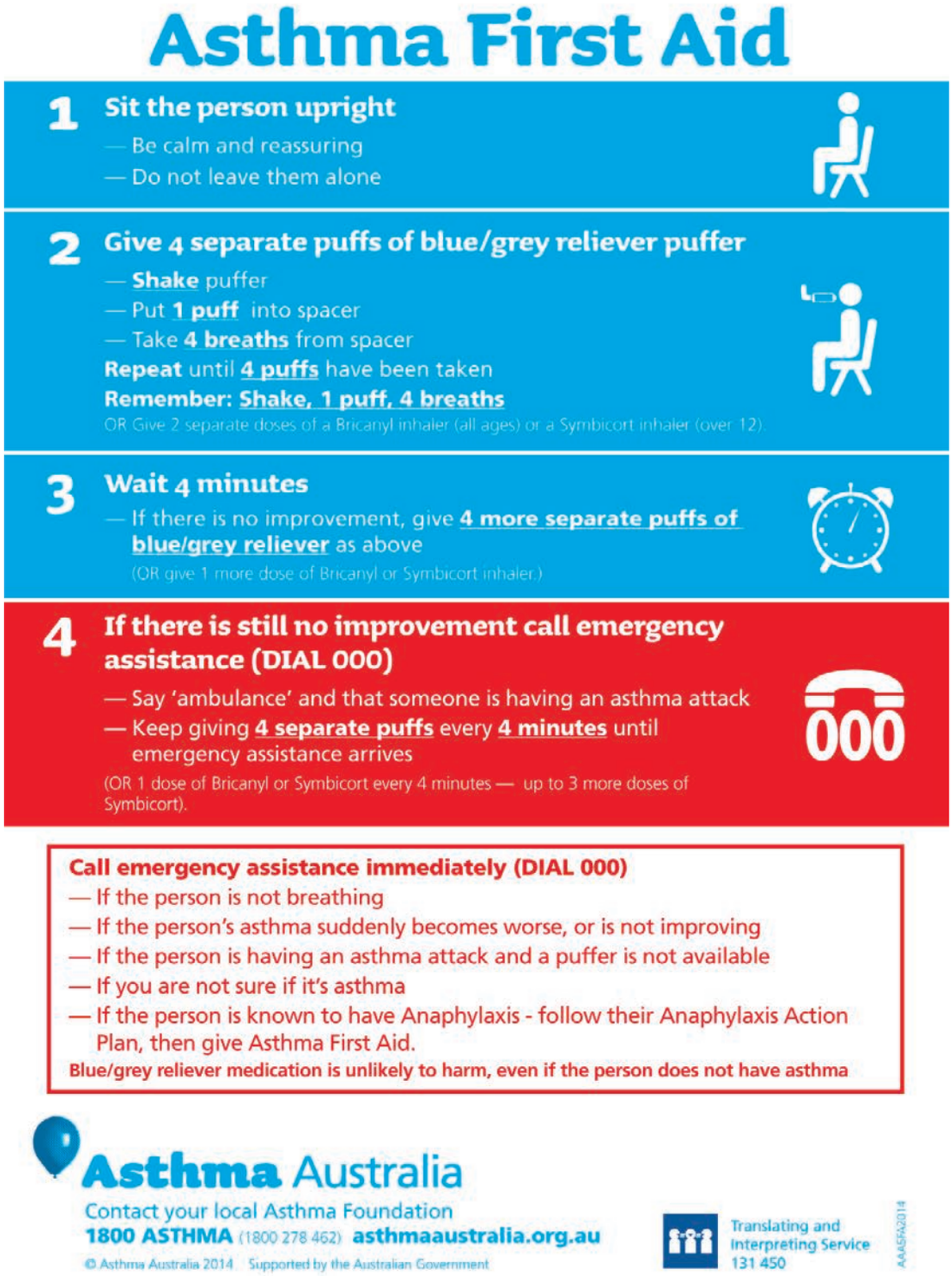

Figure 5.11 Asthma First Aid poster

Epilepsy

Epilepsy is a medical condition caused by excessive neuronal activity in the brain causing involuntary convulsions/contractions of the muscles of the body (also known as seizures), or in some cases just a loss of awareness for a period of time. Children and young athletes suffering from epilepsy typically use medication to control their seizures, allowing them to participate in physical activity.

All coaches and trainers in contact with children with epilepsy should be aware of the child's diagnosis with this condition, and know how to manage a seizure should it occur. An appropriate management plan for the child should be devised in consultation with the child's parents, the coach and the treating doctor. A general guideline for on-field management of a seizure should involve:

Figure 5.12 Children require regular rest breaks, appropriate clothing and regular sips of water when exercising in the heat

- removing any dangers from the area surrounding the child – for example, harmful objects and players (play should be stopped)
- maintaining the privacy of the injured athlete where possible, by not drawing unnecessary attention to the scene and blocking the view of others where required
- placing the athlete in the recovery position when possible
- reassuring the athlete/child after the seizure has ceased
- if the seizure lasts more than five minutes, calling an ambulance. If the child recovers before this point, the child's standard management plan should then be followed.

Note: if a child is having a seizure and they have not been diagnosed with epilepsy as far as you are aware, call an ambulance immediately.

Over-use injuries

Over-use injuries – particularly stress fractures – can arise as a result of a variety of different factors, including poor technique, inadequate warm-up, faulty equipment, or excessive training frequency, intensity and/or duration. A stress fracture is defined as a small crack in the outside of the bone surface caused by repeated high stress. As with all injuries, prevention is better than cure, so measures should be taken to avoid their onset. Measures may include gradually building up training intensity, breaking up repetitive movements to allow that part of the body to recover, limiting the level of impact during training and ensuring that all equipment is in good working order (e.g. shoes fitting properly, supporting appropriately and not worn out). If they do occur, the treatment for over-use injuries involves rest, physical therapy, medication and modification of the training procedure to prevent recurrence of the injury.

Thermoregulation

Thermoregulation is the ability of the human body to maintain its temperature within normal limits, generally between 36.5 and 37.4°C. When exercising in the heat, children typically have higher core temperatures than adults. This variation is primarily due to a lack of sweating, which is caused by less-developed sweat glands and an overall reduced volume of fluid in their bodies. They require regular rest breaks (preferably in the shade), appropriate clothing to disperse heat and regular sips of water (Australian guidelines suggest 150–200 millilitres every 20 minutes during exercise).

thermoregulation ability of the body to maintain its temperature within normal limits

Children and young athletes also have less muscular development than adults, and often lower body fat levels. This means that they are less able to generate and conserve body heat when they are cold. When exercising in colder temperatures, children require appropriate warm clothing and regular large muscle group exercise movements to maintain their core temperature.

Appropriateness of resistance training

Strength and conditioning are key components of training among adult athletes, and there has been a great deal of debate about the appropriateness of resistance training for young athletes. The current position on youth resistance training by the Australian Institute of Sport is that it is safe and can help increase strength, prevent injury, and enhance motor skills and performance. However, it is vital that coaches of juniors at any level have a clear understanding of what should and should not be done.

The key guidelines for strength training of young athletes are:

- Strength training should focus on skills and technique rather than lifting 'heavy'.
- Children should work on strengthening all large muscle groups using body weight and progressing to light free weights when able.
- The general rule is one to three sets of 10–15 repetitions of a variety of exercises, with a frequency of two to three days per week on non-consecutive days.
- Children/young athletes should never 'lift heavy' (a weight that they cannot lift 10 times) until they have reached physical maturity. This is due to the high potential for damage to the growth plates.

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Figure 5.13 Children/young athletes should only progress to lifting light free weights when able

Summary 5.11

1 Select one of the following and propose how it can be managed in relation to the ways young people engage in sport:
   - medical conditions
   - over-use injuries
   - thermoregulation
   - resistance training.

2 Access the document *Safety Guidelines for Children and Young People in Sport and Recreation* (see www.cambridge.edu.au/hscpdhpe1weblinks). Summarise its key points.

Checklist 5.12

Select one of the following and outline the issues surrounding it in relation to the ways in which young people engage in sport:
- medical conditions
- over-use injuries
- thermoregulation
- resistance training.

Adults and aged athletes

There are a great number of active adults and older people who remain competitively involved and successful in sport well into their later years. These individuals typically have been active in sport for their entire lives.

As a result of the normal ageing process, there is an overall degeneration in the body's ability to function at a high level and a higher risk of developing many diseases. For athletes from this age group to continue to participate in sport into their more advanced years, many medical and physical factors must be considered.

In 2005, the Australian government and Sports Medicine Australia developed a document entitled *Choose Health: Be Active* as a physical activity guide for older Australians.

Heart conditions

Heart conditions such as hypertension (high blood pressure) can lead to problems for the older athlete competing in higher intensity exercise if not properly accounted for. Participation in appropriate exercise over a prolonged period of time can improve heart function and reduce blood pressure. Athletes who suffer from a heart condition must seek medical advice about the type and intensity of exercise that would be most appropriate for them before commencing a program. A general consensus is that exercise should be low resistance, low impact and gradually increased as the athlete's exercise tolerance improves (this will vary with the age and fitness level of the athlete).

Figure 5.14 There are many medical and physical factors that must be considered for adults and older people wishing to continue participating in sport

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Summary 5.13

1 Explain how having the following medical and physical issues can impact on an adult or aged athlete:
   - heart conditions
   - brittle bones
   - joint mobility issues.
2 Access the document *Choose Health: Be Active* (see www.cambridge.edu.au/hscpdhpe1weblinks). Outline its key points.

Checklist 5.14

Identify the sports participation options available for aged people with the following medical and physical issues:
- heart conditions
- brittle bones
- joint mobility issues.

Fractures/bone density

Bone mineral density peaks at 35–40 years of age. As we age beyond these years, the density of bone progressively decreases, making the older athlete much more susceptible to broken bones. This decrease in bone density with age is known as osteoporosis. Participating in appropriate weight-bearing exercise and maintaining recommended daily calcium intake are steps that should be taken to limit the degree of bone density loss in the older population. High-impact and contact sports should be avoided. If diagnosed with bone density loss, medical opinion should be sought prior to commencing an exercise program.

Flexibility/joint mobility

The freedom of motion of a joint in terms of flexibility generally decreases with advancing age. This is due primarily to osteoarthritis and progressive tightening of muscles. Appropriately prescribed exercises can improve joint mobility and flexibility of the aged athlete, thereby improving function, level of discomfort and ability to perform exercises. A medical practitioner or physiotherapist can provide advice on what exercises are suitable for the specific needs of the individual adult athlete. Yoga and specific stretching have been advocated as the best options for improving flexibility in the older population, while activities that involve sudden movements that stretch joints and muscles beyond their capabilities should be avoided. Key muscles requiring stretching are hamstrings, calves, quadriceps and gluteals (lower limbs).

Female athletes

Participation in regular physical activity and sport typically yields the same physical, psychological and social benefits for women as it does for men. However, there are a small number of factors about which the female athlete should be aware to ensure they are getting the most out of their training and participating safely. Women athletes can often suffer from a condition called the female triad. This condition includes low energy availability (eating disorders), menstrual irregularities and weak bones (osteoporosis). Tips for female athletes include keeping track of their periods, not skipping meals or snacks, visiting a dietician and not succumbing to external pressures.

Eating disorders

Eating disorders are more common among female athletes (dance, gymnastics, rowing) and the female population at large. Anorexia (lack of food intake) and bulimia (purging/throwing up following meals) are the most common forms of eating disorders. There are varying degrees of severity of these conditions experienced by those who suffer from them. Restrictive eating disorders such as those mentioned above impair physical performance, reducing the energy available for active muscle contractions. Dehydration can greatly impact the body's capacity to function at the level required for optimal performance, and also inhibits thermoregulation ability.

Figure 5.15 Weight-bearing exercises continue to be important for adults and aged athletes

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Iron deficiency

During the menstruation process, females lose an increased level of iron from their body than they do normally. This means that they must ensure they are ingesting an adequate level of iron via their diet to maintain normal levels. Iron is vital to the production of haemoglobin, which is responsible for the transport of oxygen in the bloodstream. This transported oxygen allows the body's muscular and energy-producing systems to function. A lack of iron (iron deficiency) generally leads to anaemia (lack of red blood cells), which causes fatigue, reduced energy production and diminished lactate clearance. These factors will decrease the athlete's ability to participate in sport, and in serious cases threaten overall health.

Bone density

Low bone density is more common among female athletes, and becomes more so with age. A lack of bone density decreases the bone strength, therefore increasing the risk of fractures. It is recommended that female athletes consume a diet high in calcium (at least 1000 milligrams per day) and participate in regular weight-bearing exercise to diminish the incidence of osteoporosis and other issues associated with decreased bone density.

Figure 5.16 Consuming a diet high in calcium and participating in weight-bearing exercises will reduce the risk of developing osteoporosis

Pregnancy

Falling pregnant does not mean that the female athlete has to cease participation in sport. She should, however, follow the guidelines set by Sports Medicine Australia concerning ongoing participation in physical activity during pregnancy. Physical changes experienced during pregnancy include:

- weight gain of 10–15 kilograms
- loosening of ligaments
- increased resting heart rate
- decreased blood pressure
- increased blood volume.

In light of these physical changes, an exercise program of light- to moderate-intensity exercises with low-impact tasks should be appropriate. Pregnant athletes should ensure that they are not getting too hot or too short of breath to talk in full sentences during exercise. Pregnant athletes should consult their doctor regarding the appropriate level of exercise for them. Examples may include hydrotherapy, aqua-aerobics, swimming, walking and yoga.

Figure 5.17 Participation in sport need not cease for pregnant women

Summary 5.15

1 Select one of the following topics and explain the issues surrounding it for female athletes:
   - eating disorders
   - iron deficiency
   - bone density
   - pregnancy.
2 Access the Active Women website (see www.cambridge.edu.au/hscpdhpe1weblinks). Summarise the key issues highlighted on this website for active women.

Checklist 5.16

To what degree do iron deficiency and decreased bone density affect a female athlete's participation in sport?

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5.3 Enhancing the well-being of athletes through preventative action

Preventative actions put in place by coaches and athletes can reduce the risk of injury, thereby enhancing athletes' overall well-being. Preventative actions are typically simple measures incorporated into the training regime to ensure that the physical, mental and social health of the athlete is maintained. This ensures the enjoyment of the athlete, improves training quality and reduces the frequency and severity of injuries.

Driving questions 5.17

Reflect on any injuries that you have suffered from physical activity and sport.

1. **Could anything have been done to prevent this injury from occurring? Could it have been worse? What prevented this?**
2. **What actions do you currently take to increase your safety while participating in physical activity?**

Physical preparation

Sustaining an injury reduces the athlete's time on the field of play during the season and, if severe enough, can end an athlete's career. Thorough physical preparation is vital to the prevention of injury. Implementing appropriate preventative actions places the athlete in a much stronger position to avoid injury and complete the season without incident.

Pre-screening

Pre-screening is an important preventative measure that should be performed prior to the commencement of the training program/season. It is extremely useful for detecting any existing physical or medical issues that may necessitate a change to the training type, frequency and intensity required. The components of a pre-screening assessment will vary depending on the sport in which the athlete is competing. Examples of components may include 100-metre sprint time, vertical jump height, horizontal jump length and 'beep' test scores.

In some sports, pre-screening of physical characteristics is an important consideration for directly preventing injury – for example, a baseball pitcher requires enough external rotation of the shoulder to generate a fast pitch, and a player with a long, thin neck should not be placed in the front row of a Rugby Union scrum.

For an example of an adult pre-screening assessment, see www.cambridge.edu.au/hscpdhpe1weblinks.

Skill and technique

Athletes with a superior technique and level of skill in their given sport are better able to participate in sport without adverse incidents. This is due to the fact that they have a better awareness of what is happening around them on the field of play, as they no longer need to pay attention to the basics of the sport. A less skilled performer will often be focused on performing basic skills – for example, dribbling the ball in basketball – which may inhibit their ability to see all events in their surroundings, thereby increasing their risk of collision and injury.

Athletes with superior technique have a reduced risk of injury, as their body is biomechanically efficient to perform the skills required for their sport in order to achieve the best possible results. A tennis player who demonstrates correct body position, alignment, head position, arm action and follow-through will have a decreased risk of injury. In contrast to this, a novice athlete who demonstrates incorrect body position, alignment, arm action and so on is more likely to sustain muscular strain or other injury.

Physical fitness

Being physically prepared for participation in sport reduces the risk of injury. Good general fitness should be achieved/maintained before an athlete is to participate in sport. For fitness more specific to the requirement of the sport, certain aspects of fitness should be focused upon – for example, muscular strength for power lifters, cardiovascular fitness for cross-country runners, and muscular endurance and flexibility for gymnasts.

A lack of physical fitness puts the athlete at a heightened risk of injury – for example, participating in cross-country running while only performing weight training would not prepare the

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Figure 5.18 Warm-up, stretching and cool-down are important components of preparing for participation in sport

athlete for the task required; or a dancer who did not perform adequate stretching in preparation for their routine would be at increased risk of sustaining a muscle tear.

Warm-up, stretching and cool-down

An appropriate warm-up is designed to prepare the body for the high physical demands of participation in sport. An effective warm-up starts slowly and gradually increases in intensity, with a specific focus on the movements and muscles required in the sport in which the athlete is to compete – for example, a warm-up in Rugby League must include running with changing directions, light contact, kicking, passing and jumping. For most athletes, a 5- to 10-minute warm-up is enough, though in cold weather the duration of the warm-up may need to be increased.

The warm-up aims to:

- prepare the body and mind for the activity
- increase the body's core temperatures and blood flow to working muscles
- increase the heart rate
- increase the breathing rate.

The cool-down is an important component of the training session and post-session recovery that is often neglected by coaches. Following heavy exertion, the body needs time to slow down gradually rather than experiencing a sudden stop at the completion of the game/training. This gradual slowing down of activity decreases post-training soreness. The cool-down should occur immediately following the game/training session, can be the same type of exercises as performed in the warm-up (though at a lower intensity) and should also last for 5 to 10 minutes.

Stretching is a vital component of both the warm-up and the cool-down. Dynamic (active) stretching is more effective than static stretching during the warm-up, as it prepares the joints and muscles for the activity and range of motion required during sporting performance. A lack of stretching during the warm-up will significantly increase the risk of muscle tear or joint strain, as the joint has not been gradually exposed to the challenges that will be placed upon it. Static stretches are preferred during the cool-down, as they have been found to decrease post-sport soreness and joint restriction.

Summary 5.18

1 Propose the types of questions that should be asked in a pre-screening.
2 Who should undergo pre-screening prior to exercise?
3 How important are skill and technique in preventing injury?
4 Why is physical fitness essential to preventing injury?
5 Evaluate the importance of both the warm-up and cool-down. Is one more important than the other?

Checklist 5.19

Select a range of sports and identify what physical preparation strategy should take priority.

Sports policy and the sports environment

Sports policy and the sports environment include the rules and regulations of sport to ensure fairness and order for all athletes. These rules are essential for the well-being and safety of athletes. Without rules that govern fairness and order, there is increased risk of injury to participants. Other key preventative actions include using protective equipment, matching opponents, and providing safe grounds, equipment and facilities.

Rules of sports and activities

The rules and policies of sport are designed to give direction and order to ensure the safety of all

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participants. Each governing sports body will have individualised policies for safe conduction of its sport – for example, helmets in gridiron football, and heat and adverse weather policies for many sports.

Rules in sport are necessary to ensure fair, competitive, safe and organised play. Without rules, there would be an increased incidence of injury in all sports. A good example of rules diminishing risk is a recent change in Rugby League, with shoulder charges being outlawed to reduce the incidence of head injuries.

Modified rules for children

Sports rules are modified for children to ensure their safety/well-being, and at times simplify the game to allow a more easily flowing match.

Rule modifications for safety include restrictions on the number of pitches junior baseball pitchers are permitted to throw in a match, compulsory mouthguards in some sports, and restrictions to the number of minutes junior Rugby Union players are permitted to play within a week.

Rule modifications for ease of play include allowing junior netballers to shuffle feet, junior basketballers to double dribble, and smaller fields and goals in soccer.

Matching opponents

The matching of junior athletes with athletes of similar physical function, mental function and skill is important to reduce the risk of injury among young athletes. There are three primary methods to ensure athletes' safety in matches:

- **Age limits.** These are set for many junior sports to match athletes with others of a similar age, cognitive function and physical attributes.
- **Level of growth/development.** For many sports, there are weight restrictions to match opponents – for example, in boxing, some Rugby Union and Rugby League competitions, and judo. These measures are aimed to prevent injuries caused by impact or collision between a small athlete and a much larger opponent.
- **Matching skill level.** This is done by assessing the athlete's skill level and sorting into divisions or grades. This reduces the risk of injury, as athletes are competing against opponents with matched abilities and skills.

Use of protective equipment

Protective equipment is extremely important for safe participation in many sports. Some examples of protective equipment used in junior sport include the following:

Figure 5.19 Knee pads are important for sports such as skateboarding and volleyball

- Shin pads are compulsory in soccer and hockey to protect players' shins from soft- and hard-tissue injuries.
- Mouthguards are also compulsory in many sports – such as Rugby League, Rugby Union, hockey and boxing. They protect the players' teeth from being knocked out and their tongues from being bitten, and prevent other mouth injuries.
- Helmets protect the head from hard- and soft-tissue injuries in sports such as baseball, gridiron, skiing and ice hockey.

Safe grounds, equipment and facilities

To ensure the safety and well-being of all athletes, the grounds, equipment and facilities need to be in good condition and appropriate to the requirements of the sport. Examples of potential dangers from not meeting these requirements include the following:

- A netball court that has poor drainage, leaving large puddles on the court when it rains, rendering the court unsafe for use during wet weather.

Figure 5.20 A field with poor drainage and puddles creates an unsafe playing surface

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Summary 5.20

1 Almost all sports have officials in charge of enforcing their rules. The game of Ultimate has no referees, with the players refereeing the game themselves. In your opinion, does this contribute to safe participation?
2 Discuss why it is important to modify rules for children.
3 In what ways should opponents be matched and to what level of sport?
4 Debate whether protective equipment should be made compulsory across all levels of sport, especially for young athletes.
5 Propose what things need to be checked prior to any sport or activity taking place in terms of grounds, equipment and facilities.

Checklist 5.21

Critically analyse the following and assess whether they promote safe participation:

- the IRB under-19 Law Amendments for Rugby Union (see www.cambridge.edu.au/hscpdhpe1weblinks)
- the SMA guidelines for participating in the heat (see www.cambridge.edu.au/hscpdhpe1weblinks)
- the National Junior Sport Policy (see www.cambridge.edu.au/hscpdhpe1weblinks).

- A soccer ground that has large holes/divots significantly increases the risk of ankle and knee injuries.
- A Rugby Union ground with a large amount of rocks/broken glass on it will make abrasions and lacerations much more likely.

Environmental considerations

Adverse environmental conditions, such as excessively low or high temperatures, have the capacity to negatively impact on the well-being of athletes attempting sporting participation in these conditions. There are a number of thermoregulation techniques that the athlete may adopt to help regulate their body temperature during sport. A variety of preventative strategies have also been developed to prepare and protect the athlete for sport in adverse weather conditions. Strategies include:

- enforcing guidelines for fluid intake
- maintaining temperature regulation of the body
- developing **acclimatisation** to conditions
- minimising negative impacts of adverse climatic conditions.

acclimatisation preparing the body for a particular climatic condition

Temperature regulation

The ability to regulate body temperature is vital in order for the athlete to perform at their peak and prevent adverse health effects of extreme temperatures. The human body has a normal core temperature of approximately 37°C, and can only withstand slight variations in body temperature either side of this before adverse health symptoms begin to appear. An elevated core temperature will increase the risk of hyperthermia and a lowered core temperature will increase the risk of hypothermia. There are four primary methods of temperature regulation that the body uses to maintain control temperature.

Convection

Convection is the process of air moving across the skin's surface – for example, wind. For heat loss to occur, the air moving across the skin will be cooler than the skin. The cooler the passing air and the stronger the air flow, the faster the temperature change will occur. For heat gain to occur, the air moving over the skin must be warmer than the surface of the skin.

convection air moving across the skin's surface

Radiation

Radiation is the transfer of heat to and from the atmosphere. For heat loss to occur, the atmosphere surrounding the body's surface must be cooler than the body – that is, the skin surface will warm the air surrounding the body, causing the net effect of heat loss from the body. For heat gain to occur, the atmosphere surrounding the body's surface must be warmer than the skin temperature, causing the atmosphere to warm the skin via radiation, leading to the net effect of heat gain.

radiation transfer of heat to and from the atmosphere

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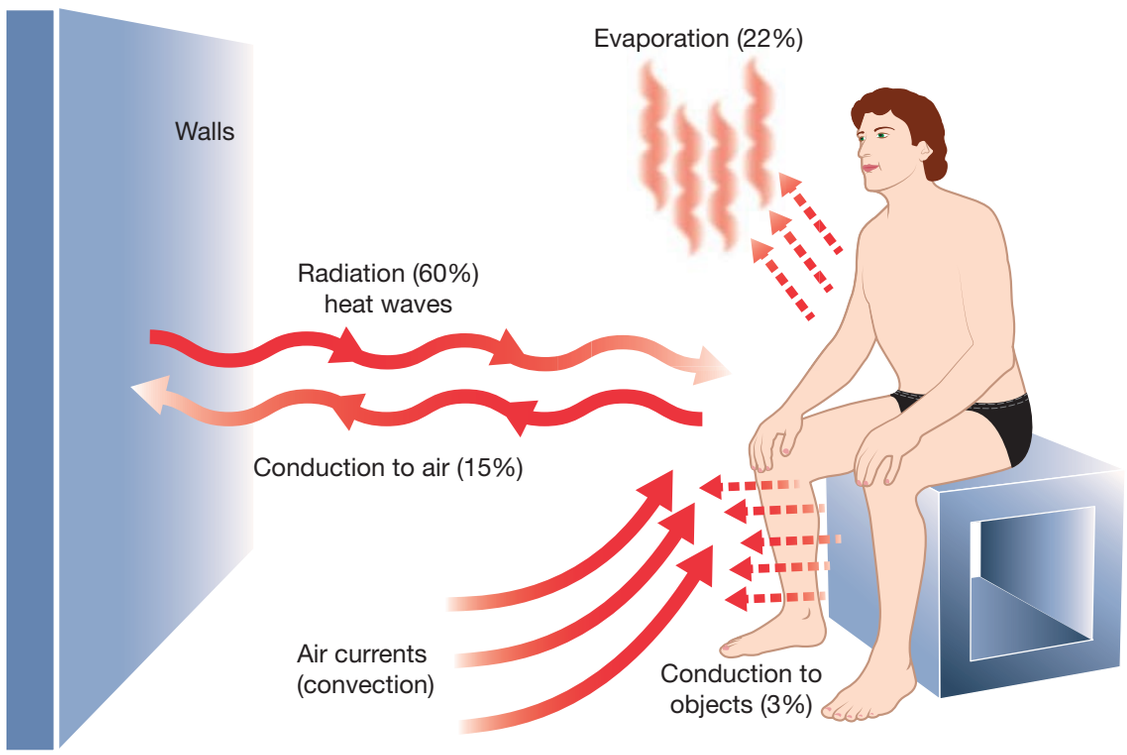

Figure 5.21 The body's temperature-regulation mechanisms

conduction
transfer of heat to and from the skin via direct contact with an object

Conduction

Conduction is the transfer of heat to and from the skin via direct contact with an object – for example, an ice pack on the skin causes direct heat loss, while skin contact with warm clothes causes heat gain.

evaporation
loss of heat via sweating

Evaporation

Evaporation is the loss of heat from the body via sweating. The airflow over the fluid (sweat) on the surface of the skin causes accelerated heat loss from the body into the surrounding air.

Figure 5.22 Climate-appropriate clothing and a suitable warm-up are especially important for snow sports

Climatic conditions

Altered climatic conditions can affect the sporting performance of an athlete. Extremes of climatic conditions generally adversely affect the athlete's involvement. Examples include:

- Low environmental temperature and high wind increase the risk of lowering the athlete's core temperature, causing hypothermia. To prepare for these conditions, an athlete would need to warm up effectively, acclimatise to conditions before commencing play and wear appropriate clothing, leaving as little skin exposed as practical.
- High environmental temperature and humidity put the athlete at risk of dehydration, and elevated core temperature (hyperthermia).

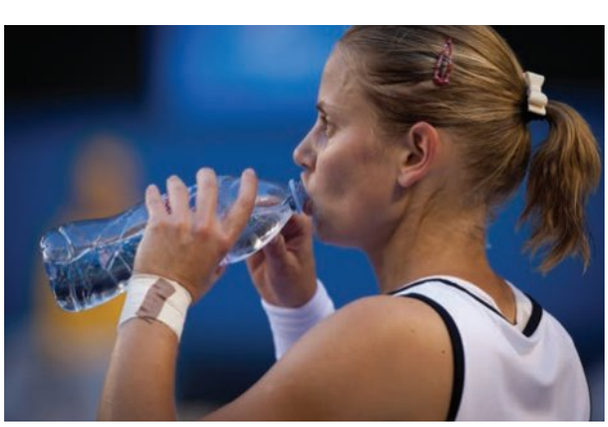

Figure 5.23 High temperatures and humidity necessitate a higher intake of fluids

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Fatigue, dizziness and lack of coordination may hinder the athlete's performance. It must be noted that high humidity inhibits the body's ability to lose heat from sweating, thereby exaggerating the effects of heat. To prepare for these conditions, the athlete would need to increase fluid intake, wear appropriate clothing (leaving as much skin exposed as practical) and take regular rest breaks in the shade if possible.

- At higher altitudes, the air is thinner, meaning that there is less oxygen available in the air for the lungs to extract and use for muscle performance. Athletes should spend a number of weeks training at high altitude prior to participating in competition in order to acclimatise adequately to perform well at altitude.

Figure 5.24 Acclimatising adequately to high-altitude environments before competition is crucial to performing well

- Rain can affect the body's ability to thermoregulate in both hot and cold conditions. In warm weather, rain may help the body to disperse heat and lower temperature. In cold weather, rain will increase heat loss from the body, thereby increasing the risk of hypothermia. In wet weather, the playing surface may become slippery, which increases the risk of injury due to collisions, falls and loss of control of sporting equipment.

Figure 5.25 Rain affects the body's ability to thermoregulate

- Air pollution can negatively affect the athlete's ability to breathe, thereby reducing the body's ability to oxygenate the blood. Oxygen is vital to muscle function and sporting participation. Symptoms of breathing difficulty may include wheezing, coughing, watery eyes and a feeling that breathing is restricted.

Figure 5.26 Air pollution affects an athlete's ability to breathe

Guidelines for fluid intake

Adequate hydration before, during and after sporting activity is vital to the performance and overall health of the athlete. Even a small loss of fluid can significantly impact the athlete. The

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recommendation for fluid intake during sport is 200–300 millilitres every 15–20 minutes of exercise in warm weather. An adult male athlete exercising in warm weather should drink approximately 3 litres of water per day to maintain hydration. A good method of ensuring that you have replaced all lost fluids is to weigh yourself before and after sporting involvement, with the weight lost being the amount of water you must drink.

Figure 5.27 Adequate hydration is crucial to an athlete's performance and overall health

Acclimatisation

Acclimatisation is the process of preparing the athlete's body for optimal performance in the climatic conditions that will be experienced during the event – for example, extreme heat, cold, humidity or altitude. This is achieved by training in these conditions in the months/weeks leading up to the event, thus allowing the body to adapt to function at its peak with these climatic extremes. The principle of acclimatisation has been used extensively to train athletes to function at high altitudes. It generally takes seven to 14 days to acclimatise and for adaptations to occur.

Checklist 5.23

1 Identify the strategies an athlete could employ to assist the body's temperature-regulation mechanisms.
2 Describe the impact climatic conditions have on safe sports participation.

Taping and bandaging

Taping is the process of restricting a joint's movement to prevent excessive movement that may cause new or repeated injuries to the joint. Bandaging is more commonly utilised for the acute compression/support of an injury to limit swelling. If used incorrectly, both taping and bandaging will be ineffective at controlling and preventing injuries.

Preventative taping

Preventative taping has been found to reduce the incidence and recurrence of joint injuries. Taping complements a strengthening program, although it does not replace it. After injury, the affected joint is generally weaker than it was before the injury, requiring extra support to return to sport. The primary application of preventative taping is to prevent re-injury. Some sports put athletes at higher risk of injury, as they place higher pressure on the joint – for example, weightlifting or gymnastics. In these sports, the athlete may desire preventative taping even though they have never sustained an injury to the area.

Figure 5.28 Taping can be used both as a preventative and a treatment of injury

Summary 5.22

1 Explain four ways in which the body regulates temperature.
2 What climatic conditions need to be considered by athletes?
3 Summarise the guidelines for fluid intake before, during and after performance.
4 In what situations may an athlete need to acclimatise, and how long does it usually take?

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Taping for isolation of an injury

There are specific taping techniques for isolated injuries to certain joints. Taping of these injuries is designed to restrict movement into the extremes of range, thereby preventing exacerbation or re-injury with continued sporting involvement. Of specific interest are ankle taping, thumb taping and wrist taping. For step-by-step instructions on how to perform thumb, wrist and ankle taping, go to www.cambridge.edu.au/hscpdhpe1weblinks.

Bandaging for immediate treatment of an injury

Bandaging is more commonly utilised for the initial treatment of soft-tissue injuries for the purpose of compression. Bandaging can support the area, reduce the amount of swelling and restrict the movement of the joint. Elasticised bandages are most commonly used. To be effective, the correct technique and amount of pressure need to be applied to the injured area.

Summary 5.24

1 Explain the role of preventative taping.
2 Analyse the value of taping for isolation of an injury.

Checklist 5.25

1 Demonstrate taping and bandaging of the ankle, wrist and thumb using the links at www.cambridge.edu.au/hscpdhpe1weblinks (see above).
2 What role does taping play in both the prevention and treatment of injury?

Figure 5.29 The use of special kinesiology tape is popular among professional athletes for both prevention and treatment of injuries

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5.4 Managing injury rehabilitation

Driving questions 5.26

Reflect on a particular injury you have suffered.

1 Identify some of the steps you took in the rehabilitation process. How did you know to do this and were you thorough in the process?
2 If you were not thorough, was this detrimental to your making a full recovery?

Sports injury management procedures are aimed at restoring the athlete to their pre-injury level of function, including strength and flexibility, in the shortest period of time. The injury-recovery process of an athlete consists of two primary components: rehabilitation procedures and readiness for return to play.

Rehabilitation procedures

Rehabilitation procedures are a series of measures put in place to optimally manage an athlete's injury, to ensure that they return to peak strength, flexibility and function in the shortest period of time while avoiding re-injury of the same area in the future. With the right injury-management procedures, an athlete's rehabilitation time can be greatly reduced, allowing them to return to play sooner.

Progressive mobilisation

Progressive mobilisation involves the slowly graduated movement of the injured area into an increased range of movement until the full range of the joint movement is regained. It involves active movement (by the athlete) and passive movement exercises (by the treating practitioner/physiotherapist) to slowly expose the recovering tissues to increased range. Progressive mobilisation should largely be pain free, with the aim of preventing stiff joints and tight muscles post-injury.

Graduated exercise

- **Stretching** is the process of extending one or more joints to take a muscle to the outer extent of its range, thereby stretching it to enhance muscle-tendon length. Stretching is aimed at maintaining and improving the range of movement/flexibility of a muscle or series of muscles. Stretches should be held for 30 seconds, with no 'bouncing' at the extremes of range (this may cause a muscle to tear). Proprioceptive neuromuscular facilitation (or PNF, see Chapter 2), is a popular form of stretching.
- **Strength/conditioning** is the graduated exposure of the injured area to resistance/weight training, to make sure that strength is back to pre-injury levels before returning to sport.
- **Total body fitness** involves gradually exposing the entire body (including the lungs and heart for aerobic fitness) to increasingly high levels of exercise as the rehabilitation process progresses. This is vital, as the entire body deconditions with time away from playing sport. Condition and function of the entire body (including skills, flexibility, agility and endurance) should be targeted in training throughout the rehabilitation process to facilitate an athlete's timely return to sport.

Training

Training should be modified throughout the rehabilitation process to match the athlete's current level of function. Normal training should be avoided through the initial stages to allow the injury to settle. Following this stage, basic skills strength and flexibility should be introduced as appropriate. It is only after the athlete is able to train back at their pre-injury level that they should be considered fit to return to full sporting participation.

Use of heat and cold

The application of ice to an acute injury is vital to the rehabilitation process. Cold compression to the injury site limits the degree of inflammation and swelling, as the body will direct less blood flow there. Cold may be applied using liquid ice packs, ice bagged in plastic or cold water/ice baths and immersion. For optimal management, cold should be applied for 20 minutes every two hours for the initial 48 hours post-injury. Cold can also be used as the athlete returns to sport after injury, as it settles the area back down following exposure to heavy loading. Heat should not be used in the initial period post-injury, as it will increase blood

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flow, swelling and inflammation to the area. The benefit of using heat is in settling down muscular spasms/tightness and warming up the joint for load. Its primary use is in the later stages of the rehabilitation process.

Summary 5.27

1 What is progressive mobilisation?
2 Explain what graduated exercise involves, and what the graduations are.
3 Evaluate the role training, and heat and cold, play in rehabilitation.

Checklist 5.28

Outline the rehabilitation process for the following:

- a hamstring tear
- a shoulder dislocation
- a ruptured anterior cruciate ligament.

Returning to play

An athlete returning to sport before they have regained sufficient strength, flexibility and function is likely to cause re-injury or more damage to the affected area. A number of indicators of readiness for return to play have been identified to assist the transition of an athlete back to full training and on to the field of play.

Indicators of readiness for return to play

The athlete should have regained full pain-free range of motion of the injured joint/area prior to returning to sport. They should also have full strength and the ability to perform the basic movements and skills required in their sport – for example, a basketball player returning from an ankle injury must be able to push up on to their toes, hop, jump off and land on the affected ankle without issue or pain before returning to play.

Monitoring progress

An athlete must meet specific criteria for function and fitness to be considered ready for return to play. Having the results of such tests assists the coach or rehabilitation practitioner to make an informed decision about the athlete's physical readiness for return to play. The specific tests used will vary, depending on the sport in which the athlete competes. An example for a baseball pitcher recovering from a shoulder injury may be a measurement of shoulder external and internal rotation compared with that at the start of the season.

Psychological readiness

As an athlete recovers from injury, they may become anxious about the prospect of returning to play. Despite being physically prepared, an athlete may not yet be psychologically prepared for return to play. Techniques to encourage an athlete to be psychologically prepared include:

- the gradual introduction of sport-specific skills to training sessions – for example, practising lay-ups in basketball
- playing low-intensity/impact games at training – for example, touch football for Rugby League
- playing the athlete at a lower level of competition – for example, reserve grade if a first-grade player.

Specific warm-up and procedures

It may be necessary to tailor the athlete's warm-up to specifically target and prepare the previously injured area for the loads it will experience during sporting performance – for example, for a knee injury, doing agility work with a great deal of directional change during the warm-up.

Return to play policies and procedures

Each sport will have its own set of policies and procedures that govern whether an athlete is ready to return to sport post-injury. The well-being of the athlete is the primary concern in determining the duration of time required on the sideline before they will be permitted to resume sporting involvement. An example of sporting policy determining return to sport is the rule in contact sport regarding 'knock-outs'/concussions, with a set period of time and psychological screening tests deciding the player's readiness for resumption of contact sport.

Ethical considerations

As an athlete, particularly at a professional level, it is common to experience pressure to return to sport as soon as possible, regardless of physical

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and psychological readiness. Athletes will feel that they are letting their team-mates, coach, team owners, fans and sponsors down if they are spending too long out of the game injured. They may also fear the financial consequences if they were to be dropped from the team due to recurrent injuries. However, if an athlete returns to the field of play prematurely, they significantly increase their risk of further significant injury, which may threaten their career in the sport.

The use of painkillers to mask pain symptoms and allow an athlete to return to play is also associated with a greatly increased risk of recurrence or significant injury, as it inhibits the body's natural protective pain mechanisms.

Summary 5.29

1 Consider why it is essential that athletes are pain-free before returning to play. Do you think this happens in reality?
2 Propose how you can monitor the progress of a player returning from injury.
3 Are there specific warm-up activities that would benefit an athlete returning to play?
4 Explain the risks athletes face if they return to play too soon or use painkillers to enable them to play.

Checklist 5.30

1 Identify the skill or physical tests that could be used to determine an athlete's readiness to return to play.
2 Suggest who should have the ultimate responsibility for deciding whether an athlete returns to competition.
3 Discuss whether athletes should be allowed to use painkillers in order to compete when injured.
4 Examine the Australian Rugby Union concussion policy (see www.cambridge.edu.au/hscpdhpe1weblinks). Do these guidelines protect the player? Should these procedures be followed by other sports?

Figure 5.30 A physiotherapist can help assess an athlete's readiness for returning to play

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Chapter summary

- Sports injuries can be classified by the cause of injury (direct, indirect and over-use) and the tissue type damaged (hard and soft).
- Soft-tissue injuries are the most common form of injury, and include several different types (tears, sprains, contusions, abrasions, lacerations and blisters). The healing process of soft-tissue injuries involves the inflammatory response, which has three phases (acute inflammatory phase, repair phase and remodelling phase). The RICER (rest, ice, compression, elevation and referral) procedure is a way of managing soft-tissue injuries.
- Hard-tissue injuries involve injury to bone (fractures and dislocations). Assessment for medical attention and immobilisation are ways of managing hard-tissue injuries.
- The TOTAPS (talk, observe, touch, active movement, passive movement and skills test) procedure is an effective method for assessment of injuries.
- There are three groups (children and young athletes, adult and aged athletes, and female athletes) with unique factors that must be considered to reduce risk of injury when participating in sport.
- Factors to consider for children and young athletes when they are participating in sport include medical conditions (asthma, diabetes, epilepsy), over-use injuries (stress fractures), thermoregulation and appropriateness of resistance training.
- Factors to consider for adult and aged athletes when they are participating in sport include heart conditions, fractures/bone density and flexibility/joint mobility.
- Factors to consider for female athletes when they are participating in sport include eating disorders, iron deficiency, bone density and pregnancy.
- The role of preventative action is to reduce the risk of injury, thereby enhancing the overall well-being of the athlete. Preventative actions include physical preparation, sports policy and the sports environment, environmental considerations, and taping and bandaging.
- Physical preparation includes pre-screening, skill and technique, physical fitness, warm-up, stretching and cool-down.
- Sports policy and the sports environment include rules of sports and activities, modified rules for children, matching of opponents (growth and development, and skill level), use of protective equipment, and safe grounds, equipment and facilities.
- Environmental considerations include temperature regulation (convection, radiation, conduction, evaporation), climatic conditions (temperature, humidity, wind, rain, altitude, pollution), guidelines for fluid intake and acclimatisation.
- Taping and bandaging include preventative taping, taping for isolation of injury and bandaging for immediate treatment of injury.
- Injury rehabilitation is managed by rehabilitation procedures and return to play. Rehabilitation procedures are measures put in place to manage an athlete's injury to ensure that they return to peak strength, flexibility and function while avoiding re-injury in the future. Indicators of readiness for return to play have been identified to assist the transition of an athlete back to full training and on to the field of play.
- Rehabilitation procedures include progressive mobilisation, graduated exercise (stretching, conditioning, total body fitness), training and the use of heat and cold.
- Return to play includes indicators of readiness for return to play (pain-free and degree of mobility), monitoring progress (pre-test and post-test), psychological readiness, specific warm-up procedures, return-to-play policies and procedures, and ethical considerations (pressure to participate and use of painkillers).

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Exam-style questions

1 Outline ways to classify sports injuries.
2 Outline types of hard-tissue injuries.
3 Outline types of soft-tissue injuries.
4 Describe the assessment procedure used to determine the nature and extent of a sports injury.
5 Describe the management of a soft-tissue injury.
6 How does sports medicine address the appropriateness of resistance training for children and young athletes?
7 How are the needs of adult and aged athletes with heart conditions addressed to enable their continued participation in sport?
8 Assess the degree to which iron deficiency and bone density can affect female participation in sport.
9 Explain the physical preparation needed by an athlete in order to prevent injury. In your answer, provide examples from different sports.
10 Analyse how sports policy and the sports environment can promote safe participation.
11 Why are acclimatisation and fluid intake effective strategies for supporting the body's temperature-regulation mechanisms?
12 Evaluate strategies athletes use in order to perform competitively in different climatic conditions.
13 Evaluate the role taping plays in both the prevention and treatment of injury.
14 Justify the rehabilitation procedures used for an injury of your choice.
15 How are skill and physical tests used to indicate an athlete's readiness to return to play after injury?
16 Should athletes be allowed to use painkillers in order to compete when injured? Discuss.
17 Who should have ultimate responsibility for deciding when an athlete returns to competition? Justify your answer.

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Chapter 6 Improving Performance

HSC Option 4

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

- *training athletes for improved performance*
- *planning considerations for improving performance*
- *ethical issues involved in improving performance.*

Key terminology

adaptation
anabolic steroids
diuretic
EPO
isometric
lethargy
macro-cycle
micro-cycle
over-training
peaking
periodisation
plyometrics
tapering

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6.1 Training athletes for improved performance

Driving questions 6.1

1 Identify a sport that you think requires the most diverse training methods for success.
2 Identify a sport that you think is simple and more focused in its training methods.

Strength training

Strength can be defined as the capacity of a muscle or group of muscles to exert force during a muscular contraction. Muscular force produces movement, and therefore provides the basis for many sporting actions, including acceleration, deceleration, rapid changes of direction, overcoming gravity and moving mass.

Strength training is a form of physical exercise specialising in the use of varying forms of resistance training. Australian athletic preparation coach Ian King recommends the following strength training methods:

- **Control and stability**. Strength-training methods are designed to develop the ability to stabilise and control both muscles and joints during muscular movement.
- **Hypertrophy and general strength**. Strength-training methods are designed to increase muscle size and generally lead to increases in muscular strength.
- **Maximal strength**. Strength-training methods are designed to improve the capacity of the athlete to produce a lot of muscular tension against very heavy resistance.
- **Explosive power**. Strength-training methods are designed to develop strength quickly.
- **Quickness and stretch shortening cycle (SSC)**. Strength-training methods are designed to produce force quickly. The SSC increases concentric power as a result of the elastic energy generated during the eccentric phase. The eccentric component must be performed quickly, otherwise elastic energy will dissipate.
- **Strength-endurance**. Strength-training methods are designed to improve the ability to sustain power/force levels over long periods of time.

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

In the development of a strong, stable athlete, a sound base of control/stability, general strength and functional athletic development should be established before the implementation of more demanding strength qualities such as maximal strength and explosive muscular power.

Strength-training variables

Well-planned strength-training programs must consider the individual requirements/differences of individuals. This is achieved by understanding the key strength-training variables, and how they can be manipulated in order to individualise training programs. The key strength-training variables include the following:

Repetitions

In strength training, a 'repetition' refers to the correct manner in which a weight is lifted and lowered in one complete cycle. An 'isotonic' muscular contraction consists of an eccentric (muscular lengthening phase) followed by a pause (depending on the movement) and finally the concentric (muscular shortening phase). The eccentric phase, pause and concentric phase make up one complete repetition. Ian King recommends the following repetition ranges for each method of strength training:

Training method	Repetitions
Control/stability	5–15 repetitions
Hypertrophy and general strength	8–20 repetitions
Maximal strength	2–6 repetitions
Explosive power	2–5 repetitions
Strength-endurance	10–20 repetitions plus

Table 6.1 Repetition ranges for each strength-training method

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

Sets

In strength training, a 'set' refers to a number of repetitions performed in sequence without rest, for example, 2 sets of 12 repetitions of back squats with 2 minutes' rest between sets means that the athlete completes 12 repetitions of the squat, then has 2 minutes' rest before completing the second set of 12 repetitions.

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Ian King recommends the following set guidelines per session for strength training. As a general rule, when determining the appropriate number of sets for novice to relatively inexperienced strength trainers, two to three sets per exercise with 16–24 total sets per session are recommended.

Training method	Sets
Control/stability	20–30 sets
Hypertrophy and general strength	15–25 sets
Maximal strength	5–15 sets
Explosive power	5–15 sets
Quickness and SSC	5–20 sets
Strength-endurance	10–30 sets

Table 6.2 Guidelines per session for each strength-training method

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

Resistance (load)

In strength training, 'resistance' refers to the weight or load on the barbell, dumbbell or strength-training machine. The resistance chosen should allow the individual to complete the desired number of repetitions with perfect technique. For novices and beginners, choosing a weight requires some trial and error. When the individual is able to achieve the desired number of repetitions with a given weight for all prescribed sets, it is then increased.

Figure 6.1 The squat with barbell

Figure 6.2 The dumbbell lateral raise

Figure 6.3 The power clean

Figure 6.4 The bicep curl

Order of exercise

In strength training, the 'order of exercise' refers to the specific sequence in which exercises are completed within the training sessions. Ian King recommends the following order of exercise progressions for strength training:

- **Large to small**. It is recommended that large muscle groups/exercises like the squat or deadlift are performed before smaller muscle groups/exercises like the lateral dumbbell (DB) raise.
- **Fast to slow**. It is recommended that fast, explosive exercises like power cleans are

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Figure 6.5 The deadlift

Training method	Lifting speed
Control/stability	Slow to moderate
Hypertrophy	Slow to moderate
Maximal strength	Moderate
Explosive power	Explosive, fast
Quickness and SSC	Explosive, fast
Strength-endurance	Moderate sustained tempo

Table 6.3 Guidelines for the appropriate lifting speed for each training method

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

Figure 6.6 The triceps extension

Figure 6.7 The box jump (at various heights)

performed at the start of the session, while slow movements such as the bicep curl are performed at the end of the session.

- **Complex to simple**. It is recommended that large, complex movements like the deadlift are performed at the start of the session, while simple exercises like the triceps extension are performed at the end of the session.
- **Priority.** It is recommended that the priority for the session is performed first within the session. For example, if strengthening the legs is the priority for the session, the squat or a similar exercise will be performed first.

Lifting speed

In strength training, 'lifting speed' or 'lifting tempo' refers to the speed at which an exercise is performed. For example, box jumps are performed extremely fast while split squats are performed in a slow, controlled way. Ian King recommends the following order of exercise progressions for strength training:

Figure 6.8 The lunge with upright row

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The rest period between sets and exercises

In strength training,'rest' refers to the rest time between the conclusion of one set and the commencement of the next set of exercise. Ian King recommends the following rest periods between specific strength training methods for strength training.

Training objective	Rest period between sets
Control/stability	30–60 seconds
Hypertrophy/general strength	30–180 seconds
Maximum strength	180–300 seconds
Explosive power	60–120 seconds
Quickness and SSC	30–300 seconds
Strength-endurance	15–600 seconds

Table 6.4 Rest period guidelines for each strength-training objective

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

periodisation refers to the manipulating of training loads over time in order to bring about optimal gains in performance

adaptation the human body's physiological response to training. By applying a greater load, the body will adapt in order to cope with the increased load.

Periodisation

In strength training, **periodisation** refers to the manipulating of training loads over time in order to bring about optimal gains in performance. Strength periodisation is the systematic process of gradually increasing the training stress (load) on the body to allow **adaptation** and increase strength. Strength-training periodisation generally commences with higher repetitions and lower loads, and progresses over time to lower repetitions and higher loads. See Table 6.5 for an example of an eight-week, three-program periodised strength-training program for an inexperienced strength-training athlete.

Common strength periodisation terms

- **Volume.** This is the total number of sets, reps and exercises performed in a training session. For example 16 to 24 sets per session is considered an appropriate volume for inexperienced individuals.
- **Intensity.** This refers to the weight lifted, and is expressed as a percentage of the maximum weight possible. For example, an athlete can squat 100 kilograms for one repetition, which is referred to as the 1 rep maximum. Using the above example, 1 × 10 × 70 per cent squat would mean one set of 10 repetitions at 70 per cent of the maximum squat weights (70 per cent of 100 kilograms equals 70 kilograms).
- **Adaptation.** This is the human body's physiological response to training. By applying greater load, the body will adapt in order to cope with the increased load.
- **Overload.** The overload principle is based on the fact that a greater than normal load (resistance) must be placed on the human body for it to adapt and increase strength.

The exercise

In strength training, 'exercise' refers to the type of exercise used during resistance training. The type of exercise varies depending on the specific movements related to the sports, the muscles involved, the objectives of training, the training age of the athlete and the stage of periodised training program.

Going further 6.2

Inquire

Participate in practical sessions to apply the knowledge of each training type that follows.

Resistance training

Resistance training comprises varying forms of strength training aimed to increase muscular stability, hypertrophy, strength and endurance by providing a resistance against each muscular contraction. The most common forms of resistance training consist of both shortening (concentric) and lengthening (eccentric) of muscular fibres, and are commonly referred to as isotonic muscular contractions.

Athlete level: inexperienced	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8
Program #1	1 × 15–20	1 × 15–20	2 × 12–15	2 × 12–15	3 × 10–12	3 × 10–12	3 × 8–10	3 × 8–10
Program #2	3 × 12–15	3 × 12–15	3 × 10–12	3 × 10–12	3 × 8–10	3 × 8–10	3 × 6–8	3 × 6–9
Program #3	3 × 10–12	3 × 10–12	3 × 8–10	3 × 8–10	3 × 6–8	3 × 6–8	3 × 4–6	3 × 4–6

Table 6.5 Eight-week, three-program periodised strength-training program for an inexperienced strength-training athlete

Source: Level 1 ASCA course notes.

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Examples of resistance training include elastic and hydraulic resistance-training methods.

Elastic resistance training

Elastic resistance training utilises both tubing and elastic bands of varying colours and resistances to provide muscular resistance during movement.

Common uses

Elastic resistance training is commonly used during rehabilitation/pre-habilitation training and during general fitness training.

Advantages

- Elastic resistance training is relatively cheap, portable, light weight and versatile.
- It offers progressive resistance through a free range of motion – for example, during a bicep curl as the hands move towards the chest, the resistance increases.
- Elastic bands make you stabilise the movement through activating stabiliser muscles in order to keep the movement in alignment.
- Bands can be used to incorporate sport-specific movement that can be applied in varying planes of motion. For example, soccer players utilise bands to simulate kicking movements during pre-habilitation training.
- Elastic resistance training can also be applied at varying movement speeds, and can be used in hypertrophy strength and power training.

Disadvantages

- Elastic bands can break easily, so potential for injury must be considered.
- With elastic band training – unlike dumbbells, cables and free weights – you do not know the resistance on the band. As long as you choose the appropriate weight on the band for the desired repetitions, you will still get a workout just like traditional lifting methods.
- Elastic bands can be confusing for some people in terms of determining what exercises to use.
- Elastic band training makes it more difficult to provide the overload principle. Unlike dumbbells or barbells, you cannot simply add 2.5 kilograms increase in load. The limited band resistance options mean load increases are limited.

Figure 6.9 The upright row using elastic resistance tubing

Hydraulic resistance-training machines

Hydraulic resistance-training exercise machines are designed using a cylinder filled with hydraulic oil. Upon force being applied to the lever, resistance is generated during both the pushing and pulling components of the exercise. The amount of resistance generated during the exercise depends on the effort applied to the lever. The faster and greater the force that is applied, the greater the resistance within the cylinder. Unlike free weights, hydraulic machines do not rely on gravity; rather, the resistance is provided by the oil flowing through small holes.

Hydraulic resistance machines are most commonly utilised in circuit formations in gymnasiums. The circuits are designed around the flow of hydraulic oil so that each piece of equipment is designed to strengthen varying muscle groups throughout the body. See examples in Figure 6.10 for a total-body hydraulic resistance-training circuit.

agonist the muscle responsible for causing a specific movement

antagonist a muscle that works in opposition to the movement generated by the agonist

Advantages

- Hydraulic machines allow you to work two muscle groups on one machine (**agonist** and **antagonist**). For example, a hydraulic seated leg-extension machine requires

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Figure 6.10 Example of a total-body hydraulic resistance-training circuit

you to use your quadriceps as the agonist muscle group in order to extend the legs. In a normal pin-loaded leg extension, you would have to use the quads to resist eccentrically (muscle lengthening) in order to lower the pad back to the starting position. Because hydraulic machines only work concentrically (during muscle shortening), the hydraulic leg-extension machine requires you to pull using your hamstrings muscle group (antagonist) in order to return to the starting position using the hamstrings.

- Another example of agonist and antagonist is the biceps and triceps muscle groups.
- No resistance adjustment is required. The resistance is automatically adjusted hydraulically, based on the speed and force applied to the lever arm.
- Hydraulic resistance-training equipment is excellent for circuit training, as no resistance adjustment is required.
- Hydraulic resistance-training circuit training offers both cardiovascular and muscular strength benefits at the same time.
- Hydraulic resistance-training circuits are time efficient. A 30-minute workout is ample time to achieve both cardiovascular and strength benefits.
- Hydraulic resistance training equipment offers safety. You do not have to pick up weights, and there is no danger of weights falling on top of you.

Disadvantages

- You do not know the weight you are lifting during hydraulic resistance training.
- Hydraulic resistance training does not allow you to strengthen a muscle eccentrically.
- Hydraulic resistance training equipment is extremely expensive and bulky.
- Fixed speed makes it difficult to train all types of strength.

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Weight training

Weight training refers to types of strength training that utilise the force of gravity in the form of dumbbells, barbells, weight plates, weight stacks, kettlebells, body weight exercises and medicine balls in order to exert force against the working muscle during both concentric and eccentric muscular contractions. Weight-training exercises are designed to promote improvements in strength, power, muscular endurance and muscle size.

Both weights training and strength training adhere to the same basic principles. They require the manipulation of the number of sets, repetitions (reps), tempo, exercise types, rest periods and load in order to achieve the desired training objective. For example, in explosive strength, power athletes perform two to five repetitions per exercise for five to six sets, with a load of 80–100 per cent RM (**repetition maximum**); the exercise is performed relatively slowly and requires two to five minutes of rest between sets. In comparison, an individual requiring gains in lean mass will perform six to 12 repetitions per exercise, comprising three to six sets at a load of 70–90 per cent RM, with each repetition performed at a slow to moderate speed with a shorter recovery between sets of one to three minutes.

repetition maximum the number of repetitions you can perform with a given weight before muscular failure

The benefits of weight training include:

- increased muscle, tendon and ligament strength
- increased muscle tone
- increased bone density
- increased metabolic rate
- improved posture and joint support.

Types of weight-training equipment

Weight training incorporates a variety of equipment, including dumbbells, barbells, weight-training plates, kettlebells, hand weights and medicine balls. These are generally classified as 'free weights'.

Dumbbells

The dumbbell is a type of free weight-training equipment commonly used in weight training and can be used either individually or in pairs.

Advantages

- Dumbbells offer a large variety of movements and exercise that can be performed.
- Dumbbells are relatively cheap and will last a long time. They are extremely durable.
- Dumbbells allow you to train muscle balance by training unilaterally: by focusing on the weak side you can correct any imbalances.

Figure 6.11 Weight training is strength training and has a number of benefits

- Dumbbells require you to stabilise and recruit small muscles in order to maintain form and technique.

Disadvantages

- Correct technique takes time. Beginners need to pay particular attention to correct technique when commencing dumbbell training.
- Injury risk is greater compared with machines, due to the increased stabilisation required when performing the exercises.

Barbells

Used in weight training, a barbell is a piece of exercise equipment that is used primarily in weightlifting and powerlifting; however, smaller

Figure 6.12 Barbells fit into the free weights category

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Ian King recommends the following sets, reps, load, rest period and speed of movement for each training method.

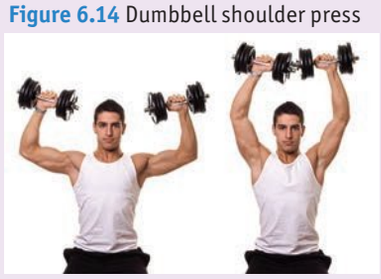
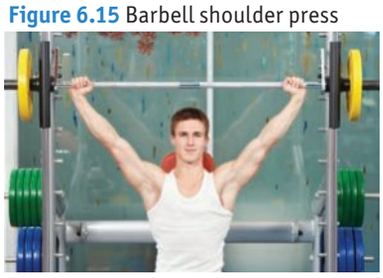
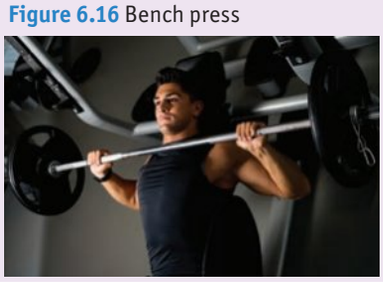
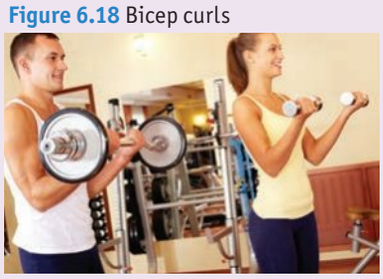
Training method	Sets	Reps	Load (% 1RM)	Rest period	Speed of movement	Exercise example
Control and stability	20–30	10–30	0=20%	0–30 seconds	Slow eccentric Long pause Slow concentric	**Figure 6.13** External dumbbell rotation 
General strength and hypertrophy	15–25	6–15	20–80%	½–2 min	Slow eccentric Medium pause Slow-medium concentric	**Figure 6.14** Dumbbell shoulder press 
Maximum strength	5–15	1–6	80–140%	2–10 min	Controlled eccentric Short pause Explosive concentric	**Figure 6.15** Barbell shoulder press 
Explosive power A= light load fast B= heavy load/ attempt to move fast	5–15	A=6–10 B=1–5	A=20–60% B=80–100%	A=½–2 min B=2–10 min	A= fast eccentric No pause Fast concentric B= controlled eccentric No pause Attempt fast concentric	**Figure 6.16** Bench press 
Quickness and SSC	5–20	5–20	0–10%	½–10 min	Fast eccentric Minimum pause Explosive concentric	**Figure 6.17** Box jump 
Strength-endurance	10–30	A=15–30 B=5–15	A=40–70% B=70–100%	A=½–2 min B=2–5 min	Varied	**Figure 6.18** Bicep curls 

Table 6.6 Principal variations for weight training for strength, power, hypertrophy and muscular endurance

Source: Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

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and lighter barbells can be used for general fitness training and body-building. These include EZ bars and trap bars. Weight plates are anchored to the barbell using collars and can be adjusted to vary the weight on the bar. Both dumbbells and barbells are referred to as free-weight training.

Advantages

- Barbells are relatively cheap.
- They are portable and do not take up a great deal of room.
- They allow for a large range of motion to be achieved.
- Numerous exercises are available for the entire body.
- Can vary weight to meet specific training needs.
- Varying lifting speed can be achieved.
- Requires the individual to stabilise in order to control the movement.

Disadvantages

- Can be time-consuming to change weights.
- Can be dangerous if plates are dropped or the weight on the bar is too heavy.
- Requires correct posture and technique, and lifting knowledge.
- Requires a spotter during exercise. A spotter in weight training is a person assisting the lifter to perform the exercise. A good spotter knows when to assist with the lift.

Weight-training plates

Weight-training plates are used primarily in Olympic lifting and power lifting, and are often referred to as 'bumper' plates. They are coated in rubber, which enables them to be dropped from a height. Weight plates made of cast iron are also utilised in weight training for strength, hypertrophy and muscular endurance. Weight plates come in sizes as small as 0.5 kilograms and as large as 50 kilograms, so provide ample opportunity for the overload principle to be applied through a gradual progressive increase in training load.

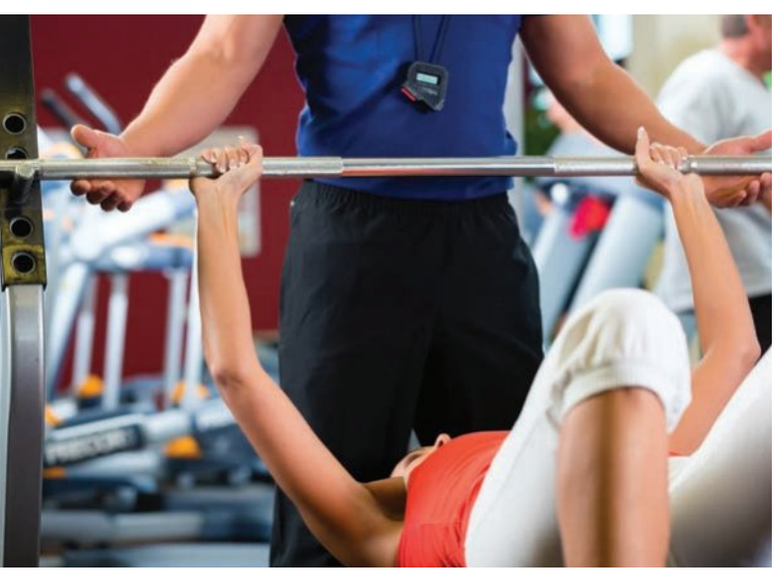

Figure 6.19 During weight training a spotter assists the lifter with the exercise

Figure 6.20 Evgeny Chigishev of Russia claims weightlifting gold during the 2008 Beijing Olympic Games

Weight-stack resistance-training machines

Using gravity as the source of resistance, weight-stack resistance-training machines have a stack of weight plates, and use pulleys and cables to connect the resistance to the lever arm or pad. An adjustable pin allows for the adjustment of the resistance of the exercise up or down in small increments of around 2.5 kilograms.

Advantages

- Unlike hydraulic resistance-training equipment, weight-stack resistance-training equipment allows you to adjust the resistance.
- Safety is a key feature of stacked machines.
- Less skill is required to maintain control and technique during the movement.
- Unlike hydraulic resistance training equipment, weight-stack resistance training equipment allows you to work the muscle both concentrically (muscle shorten) and eccentrically (muscle lengthen).
- Weight-stack resistance training exercises are an excellent choice for both beginners and the elderly, as they offer supported guided movement, ensuring perfect form and technique.
- A wide variety of exercises can be performed.
- Weight-stack resistance-training machines offer substantial stability during movements.

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Figure 6.21 A weight-stack resistance-training machine

Disadvantages

- Weight-stack machines are large and expensive.
- The limit in weight can be an issue for stronger, more experienced strength trainers.
- Not all machines suit all body types – for example, some people may be too tall or short for the machine.
- For athletes, stacked machines are not as functional as free-weight training, since the body does not have to stabilise or move during multiple planes of movement, as is commonly required in many sporting movements.

Kettlebells

The kettlebell is a cast-iron weight used to perform exercises that develop cardiovascular fitness, strength, endurance, and flexibility of the legs, shoulders and lower back. Unlike dumbbell and barbell movements, the basic swinging nature of kettlebell movements often involves higher repetitions and works the entire body.

Figure 6.22 Kettlebells have become popular in the last few years

Advantages

- They are portable, fun and relatively cheap.
- Exercises can be performed in a variety of settings.
- They promote mobility and range of motion.
- They promote strength improvements.
- They require the body to stabilise to control the movement.
- They work the body at a variety of angles.

Disadvantages

- A breakdown in technique and form can result in lower back or shoulder pain, and wrist and elbow injuries.
- They are not suitable for beginners.
- The lifts are complex and require perfect technique.

Body-weight exercises

Body-weight exercises are weight-training exercises that utilise the individual's own body weight, so do not require additional free weights. Body-weight exercises are excellent for beginners and young weight trainers, and consist of movements such as push-ups, pull-ups, core holds, body-weight squats, lunges and glute bridges.

Advantages

- Body-weight exercises are ideal for beginners, people interested in general fitness and those who do not have access to equipment.
- They require flexibility, stability and balance.

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Figure 6.23 Push-ups

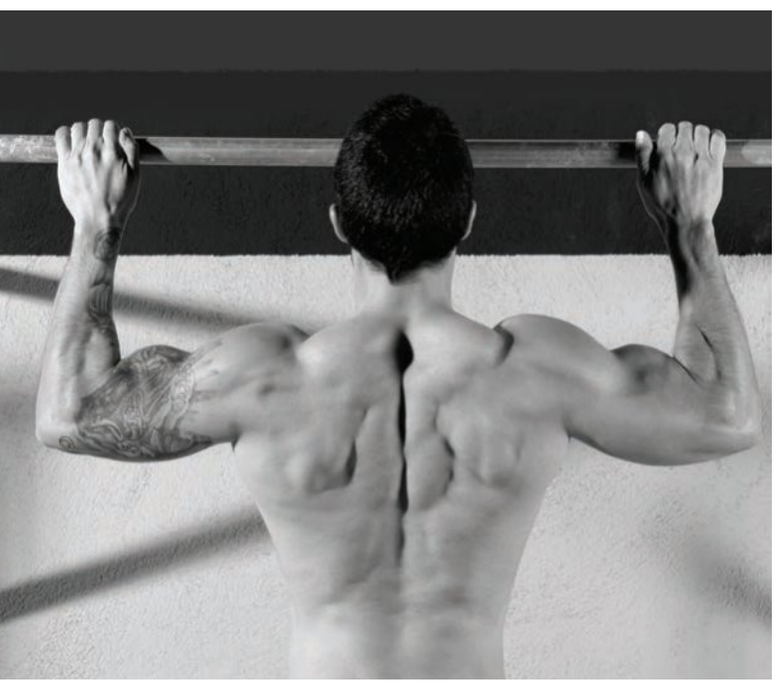

Figure 6.24 Chin-ups

Figure 6.25 Plank/core hold. This is also an example of an isometric exercise.

- They can be performed anywhere.
- They are great for all fitness levels.
- They are excellent for developing the core muscles.

Disadvantages

- Overload is more difficult, as you are generally limited to the body weight of the individual (additional weight can be included for more experienced lifters).
- Not great for maximum strength development.
- Increases in load can be difficult.

Isometric training

isometric training movements where neither the joint angle nor muscle length changes during the muscular contraction

Isometric weight training comprises strength-training movements, where neither the joint angle nor muscle length changes during the muscular contraction – for example, pulling against an immovable object. Unlike isotonic movements, which consist of a concentric and eccentric contraction, isometric exercises are performed in a static position and strengthen the muscle at a specific joint angle. For this reason, they are not used as widely as isotonic strength-training methods among many athletes.

While isometric exercises do increase strength, they are not considered specific or suitable enough for the dynamic nature of team sport athletes. However, isometric exercises are useful in the development of general strength and rehabilitation, and in sports requiring isometric contractions, like rock-climbing.

Advantages

- Maximum muscular contractions and strength can be increased with isometric training.
- Minimal equipment is required.
- Can be performed in a variety of settings.
- Great for rehabilitation.
- Isometric training can be performed extremely quickly, and can be completed in as little as a minute per muscle group. Six to eight repetitions of four to six seconds' duration are recommended.

Disadvantages

- Isometric exercises do not increase strength through the entire range of motion.
- They are not beneficial for muscular endurance.
- Isometric training can be boring.
- It makes it difficult to monitor strength improvements.
- It can decrease the contraction speed of the muscle and slow down athletic performance.
- Isometric exercises can substantially increase blood pressure.

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Figure 6.26 Rock-climbing is a sport that requires isometric contractions

Safety considerations when performing weight training

When performed correctly, weight training is a safe form of exercise; however, a failure to maintain correct posture and technique, combined with inappropriate load selections and poor execution, can result in injury. The following safety precautions should be adhered to.

- **Warm-up:** The warm-up is designed to prevent injury. An appropriate five- to 15-minute warm-up increases blood flow, flexibility and mobility, preparing the individual for the workout. For example, professional athletes commonly perform five to 10 minutes on a bike, followed by foam rolling, mobility exercises and prehab prior to commencing the session proper.
- **Technique:** Correct technique is critical to injury prevention. Commonly, individuals display poor form towards the end of a set, when fatigue sets in. For example, in the squat, an athlete will commonly round the back when they fatigue, which loads up the spine and can cause vertebral damage.
- **Pain:** If you feel any sudden/sharp pain or discomfort during the exercise, stop immediately. Beginners are advised to build up the resistance training program slowly. This gives the muscle time to develop stability, strength and muscle balance slowly. Additionally, it can help minimise delayed-onset muscle soreness (DOMS), which refers to the small tears in the unexercised muscles' cross-linkages during resistance training.
- **Breathing:** When performing resistance training, exhale during the effort and inhale when lowering the weight. Holding the breath during resistance training can limit oxygen supply to the muscles and brain, and cause possible blackouts. For example, during the bench press, breathe out when pressing the weight up away from the body and breathe in when lowering the weight.
- **Hydration:** Stay hydrated during resistance training. Failure to maintain hydration results in cramps, soreness and increased fatigue. Caution should be taken in relation to the consumption of energy drinks high in caffeine, as they can cause dehydration, tremors and, in extreme cases, heat stroke and heart attack. Simple sports drinks that contain carbohydrates, electrolytes and water do not cause ill-effects, and may be useful for high-intensity resistance-training sessions of at least one hour in length.

Examples of common weight-training exercises performed by professional Rugby League players (based on the strength training methods recommended by Ian King)

Muscle	Exercise
Legs (quads)	Single-leg box squat
Chest	Stability ball push-up
Legs (glutes and hamstrings)	Glute bridge
Back	TRX pull-ups
Shoulders	External DB rotation

Table 6.7 Stability and control exercises

Muscle	Exercise
Legs (quads)	Bulgarian split squat
Chest	DB bench press
Legs (glutes and hamstrings)	DB RDL
Back	Lying bench pulls
Shoulders	Swiss ball DB shoulder press

Table 6.8 General strength and hypertrophy exercises

Muscle	Exercise
Legs (quads)	Squat
Chest	Bench press
Legs (glutes and hamstrings)	Glute ham raise
Back	Chin-ups
Shoulders	Military press

Table 6.9 Maximum-strength exercise

Muscle	Exercise
Total body	Power clean
Legs (quads)	Jump squats with bands
Chest	Explosive bench press with bands
Legs (glutes and hamstrings)	Kettlebell swings
Back	Explosive bench pulls with bands
Shoulders	Push press

Table 6.10 Explosive power

Muscle	Exercise
Legs	Hurdle hops
Chest	Kneeling bed ball throws
Legs	Side-to-side hops
Back	Med ball slams
Shoulders/legs	Vertical med ball throws

Table 6.11 Quickness and SSC

Muscle	Exercise
Legs	Single-leg squats
Chest	Push-ups
Legs	Kettlebell swings
Back	Pull-ups
Triceps	Dips

Table 6.12 Strength and endurance

Muscle	Exercise
Abdominal (rotation)	Med ball rotations
Abdominals (anterior)	Prone hold
Abdominals (lateral)	Side hold

Table 6.13 Core

Summary 6.3

1. Outline the various types of resistance training and provide examples.
2. Outline the various types of weight-training options and provide examples.
3. Outline isometric training and provide examples.

Checklist 6.4

1. Design a strength-training program for an athlete of your choice.
2. How could you measure and monitor the training adaptations gained from the various forms of strength training?
3. Identify safe training procedures for the various forms of strength training.
4. Identify potentially harmful training procedures for the various forms of strength training.

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Aerobic training

Aerobic training utilises the aerobic energy system, and is adopted to improve the aerobic endurance levels of individuals. Aerobic training is most commonly developed using three traditional methods of training.

Continuous/uniform training

Continuous/uniform training can be defined as a steady-state method of training that lasts no less than 15 to 20 minutes. Generally considered the foundation for aerobic training, continuous/uniform training is the most commonly utilised training method for aerobic development, and signifies what most people think of as training for the aerobic energy system.

Continuous/uniform training is most effective for improving aerobic capacity, as well as cardiorespiratory and muscular endurance. It is most effective for lower level athletes and racing endurance sports like rowing, cycling, triathlon, distance running and swimming, but is much less common in sprints, power events, and field and court sports.

While generally characterised as low- to moderate-intensity exercise, continuous/uniform training can be broken down into various subdivisions that have varying effects upon the energy pathways and cater for varying performance requirements.

Continuous training guidelines

- **Mode:** Specific to the demands of the sport, also useful as a method of cross-training. Running, cycling, swimming, triathlon and rowing athletes commonly utilise continuous training methods in their training.
- **Frequency:** Should be undertaken two to three times per week for inexperienced athletes and for general health benefits, and five to six times per week for experienced endurance athletes.
- **Type:** Continuous steady-state training.
- **Time:** Generally greater than 15 to 20 minutes in duration, but specific to the sporting demands. Endurance sport athletes often need to do continuous training sessions for much longer than an hour.
- **Volume:** Depends on the type, duration, intensity, age and experience of the individual and the demands of the event for which they are training.
- **Intensity:** Generally sub-max (60–85 per cent of heart rate maximum). Maximum heart rate (MHR) is calculated at 220 beats per minute minus your resting heart rate (RHR) – for example:

  220 BPM – 60 bpm = a MHR of 160 bpm

Advantages

- Greatly improves the aerobic fitness of individuals.
- Great for the heart and respiratory system.
- Good for general weight loss.

Intensity % of maximum heart rate	Time/duration of sessions	Energy system and training pace/difficulty	Physiological benefits	Examples of sports
50–60%	60 minutes plus	Aerobic/very easy pace	Metabolises fat	Aerobics, joggers, ultra-distance runners, road cyclists
60–70%	45–90 minutes	Aerobic/easy to moderate pace	Burns both glycogen and fat, improves cardiovascular system	Marathon runners, road cyclists
70–80%	35–40 minutes	Aerobic/moderate to hard pace	Burns glycogen and improves cardiovascular system	Marathon runners, road cyclists, 10 km track runners, cross-country runners
80–90%	10–20 minutes	Anaerobic/hard pace	Burns glycogen anaerobically, improves lactate tolerance and rate of removal	Marathon, road cyclists, long-distance swimmers, 5 km runners
90–100%	1–5 minutes	Anaerobic/very hard pace	Burns glycogen anaerobically, improves glycogen burning/ lactate tolerance and removal	800–1500 m runners, 200 and 400 m swimming, rowing

Table 6.14 Continuous/uniform training

Source: See www.cambridge.edu.au/hscpdhpe1weblinks.

ISBN 978-1-107-43512-4

Distance/event	Time/world record
800 m/Athletics	1:40.01 men/1:53 women
200 m/Swimming (freestyle)	1:42 men/1:52 women
4000 m/Cycling (pursuit)	4:10
2000 m/Rowing (eight)	5:19 men/5:55 women
3000 m/Athletics (steeplechase)	7:53 men/8:58 women
1500 m/Swimming (freestyle)	14:31.02 men
51.5 km/Olympic Triathlon	1 hr:48/1 hr:58
42.195 km/Athletics (marathon)	2 hrs:03/2 hrs:15
226.3 km/Ironman Triathlon	8 hrs:04/8 hrs:54

Table 6.15 Lengths of various predominately aerobic events

- Great for general conditioning while returning from injury.
- Not much equipment is required in order to commence continuous training.

Disadvantages

- Can become boring due the repetitive nature of the training.
- While it improves aerobic fitness, it does little for anaerobic fitness. Most team sports require both aerobic and anaerobic fitness levels, as such continuous/uniform training is not as beneficial for team sport preparation as interval-based training.

Fartlek

Fartlek training means 'speed play', and refers to training methods that combine continuous training with unstructured intermittent fast bursts of interval training during the session. The variations in intensity combined with the continuous nature of fartlek training place large stresses on both the aerobic and anaerobic energy systems. While most commonly associated with middle-distance running training, fartlek methods can be implemented in many forms of exercise, including cycling, swimming, rowing, canoeing and running.

Like continuous training, fartlek training is an effective form of aerobic training designed to improve the individual's aerobic capacity. Fartlek training sessions are of greater intensity when compared with continuous training. Fartlek training helps individuals to prepare for high-intensity aerobic interval training, and exposes them to anaerobic training as well.

Fartlek training guidelines

- **Mode:** Usually specific to the demands/nature of the sport. The sport will also determine the length of the speed bursts. Middle- and long-distance runners most commonly use this method.
- **Frequency:** Generally two to three sessions per week; however, it may be more frequent for experienced endurance athletes.
- **Type:** Mixed-intensity continuous.
- **Duration:** Generally 20–30 minutes plus.
- **Intensity:** Generally sub-maximal (75–85 per cent), interspersed with much higher (maximal intensity) bursts of effort that vary in duration (10 seconds to several minutes) during the course of the exercise.

Advantages

- More realistic for sporting events, as the intensities are not set.
- A great introduction to higher levels of intensity.
- Improves recovery time between sessions.
- Increases VO_2 max.
- Improves the **lactate threshold**.
- Offers training variety with minimal equipment.
- Benefits both the aerobic and anaerobic energy systems.

lactate threshold (also known as the anaerobic threshold) the level at which the exercise intensity rises to a point where lactate (lactic acid) starts to accumulate in the bloodstream. It is at this point that the exercise is no longer fuelled aerobically, but anaerobically.

Disadvantages

- Can be difficult for untrained athletes.
- Very hard to monitor improvements due to random nature.
- Hard to judge the distance of intervals due to their varied nature.
- Hard to monitor training load due to the varied nature of the sessions.
- If performed too frequently, it can promote over-training.

Continuous and fartlek training

Both continuous and fartlek training are performed at low intensities. They are not commonly adopted by advanced team sport athletes, with the exception of endurance sports like cycling, running and triathlon.

Both continuous and fartlek training methods are most often used by young, developing athletes, by those recommencing training in order to recondition themselves at a lower intensity prior to progressing to higher-intensity interval training or by individuals wanting to burn body fat.

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Figure 6.27 A runner might use continuous and fartlek training systems

Long-interval training

Long-interval training can be defined as high-intensity intervals of one to five minutes' duration, interspersed with defined periods of rest or low-intensity active recovery. While the primary focus of this resource is to provide an understanding of long-interval training, it can also include medium (30 seconds to one minute) and short (0–30 seconds) training intervals.

Interval training has become the most popular form of training adopted by professional coaches and athletes in professional team sports, and is regularly adopted by elite runners, swimmers, cyclists and rowers.

aerobic power the capacity to do the most work in the aerobic energy system

aerobic capacity the capacity to maintain work in the aerobic energy system

Interval training effectively develops **aerobic power** and **aerobic capacity**. It increases the lactate threshold among athletes, and mimics the physiological demands of many team and individual sports. Interval training has also become an extremely popular form of cross-training for individuals requiring a reduction in body fat and improved cardiovascular fitness.

Interval training guidelines

- **Mode:** Specific to the nature and demands of the sport, but can include running, swimming, cycling, rowing and general cross-training.
- **Frequency:** One to three times per week, depending on the age and experience of the athlete.
- **Type:** Long intervals (more than one minute) in duration; however, interval training also includes short (less than 30 seconds) and medium (30 seconds to one minute) intervals.
- **Duration:** Depends on the type of interval conducted. Long intervals generally consist of efforts of one to five minutes' duration.

Sample fartlek training sessions

Example 1: Long-distance events (10 km, 5 km, 3 km, cycling)

1. Warm up with a steady jog for 10 minutes.
2. Run hard, above race pace, for four to five minutes.
3. Jog slowly for one minute.
4. Repeat six to eight times.
5. Cool down at a steady pace for 10 minutes.

Example 2: Middle-distance events (1500 m, 3 km, 5 km)

1. Warm up with a steady jog for 10 minutes.
2. Run hard, above race pace, for three minutes.
3. Jog slowly for one minute.
4. Repeat six to eight times.
5. Cool down at a steady pace for 10 minutes.

Example 3: Astrand fartlek (800 m)

1. Warm up with a steady jog for 10 minutes.
2. Run hard, above race pace, for 75 seconds.
3. Jog for 150 seconds.
4. Run hard, above race pace, for 60 seconds.
5. Jog for two minutes.
6. Repeat three to four times.
7. Cool down at a steady pace for 10 minutes.

Example 4: Multi-sprint sports (soccer, basketball, tennis)

1. Warm up with a steady jog for 10 minutes.
2. Jog for 60 seconds.
3. Run hard (three-quarter pace) for 90 seconds.
4. Jog for 45 seconds.
5. Sprint for 10 seconds.
6. Jog for 30 seconds.
7. Run backwards for 30 seconds.
8. Walk for 30 seconds.
9. Run hard for 60 seconds.
10. Repeat three to four times.
11. Cool down at a steady pace for 10 minutes.

Source: Adapted from Sports Fitness Advisor (see www.cambridge.edu.au/hscpdhpe1weblinks).

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Examples of long-interval methods adopted by professional team sport athletes

Maximum aerobic speed (MAS) training in professional team sports

Recent research indicates that the time an athlete spends at or above 100 per cent of their MAS is critical to improving their aerobic endurance levels. As a result, MAS interval training has become a popular, effective and time-efficient method of developing aerobic capacity among professional team sport athletes.

Figure 6.28 Professional team sport athletes use MAS interval training to develop aerobic capacity

Determining MAS

MAS can be determined by dividing the distance of a pre-determined aerobic test expressed in metres (e.g. 1.6 km run = 1600 m) by the time required to complete the test in seconds (e.g. Athlete A takes 6 minutes, or 360 seconds, to complete the 1.6 km time trial).

100% MAS calculation

Using the example of athlete A above,
1600/360 = 4.44 m/sec.
4.44 m/sec is athlete A's 100 per cent MAS.

Activity

Determine your own 100 per cent maximal aerobic speed from the 1.6 km time trial.

Method

Record the time it takes for the athlete to run four laps of a standard 400 m Olympic track. In order to determine an individual athlete's MAS, the distance covered in metres (1600 m) is divided by the time (in seconds) to determine the MAS. This is usually expressed as m/sec.

Designing MAS intervals to improve aerobic capacity and power

While the purpose of this resource is to provide an understanding of long-interval training, MAS intervals can include the following:

- Short intervals of less than 30 seconds' duration, generally performed at supra-maximal intensities of 120–130 per cent MAS, are great for developing aerobic power.
- Medium intervals (30 seconds to one minute) for maximal intensities (110–120 per cent MAS) are used to develop aerobic endurance.
- Long intervals (above one minute) for sub-maximal intensities (100–110 per cent of MAS) are also used for aerobic endurance.

Determining 110, 120 and 130 per cent MAS using example of athlete A above

- Step 1: Determine your 100 per cent MAS (e.g. 4.44 m/sec).
- Step 2: Multiply your 100 per cent MAS × 1.1 (4.44 m/sec × 1.1) to determine 110 per cent MAS (4.88 m/sec).
- Step 2: Multiply your 100 per cent MAS × 1.2 (4.44 m/sec × 1.2) to determine 120 per cent MAS (5.33 m/sec).
- Step 3: Multiply your 100 per cent MAS × 1.3 (4.44 m/sec × 1.3) to determine 130 per cent MAS (5.77 m/sec).

Once the 100, 110, 120 and 130 per cent MAS is determined, simply multiply the figure by the designated time for each running interval.

Long-interval example

Performing a one-minute run at 110 per cent of MAS can be calculated by:
4.44 × 1.1 × 60 = 290 m
Rest one minute between repetitions, complete six reps.

Medium-interval example

Performing a 30-second run at 120 per cent MAS can be calculated by:
4.44 × 1.2 × 30 = 160 m
Rest 30 seconds between repetitions and complete eight reps.

Short-interval example

Performing a 15-second run at 130 per cent MAS can be calculated by:
4.44 × 1.3 × 15 = 87 m
Rest 15 seconds between repetitions and complete two sets of six reps with a two-minute rest between sets.

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- **Intensity:** Can comprise intensities that are at or above the maximum aerobic speed, or at or above the anaerobic threshold.
- **Rest:** For longer intervals performed at 100–110 per cent maximum aerobic speed (MAS), a 1:1 work-to-rest/active rest ratio is recommended. For medium and short intervals performed at 120–130 per cent MAS, a 1:1 passive rest between reps is recommended.
- **Repetitions:** Depends on the level of the group and length of the interval, but can range from six to 16 repetitions.
- **Sets:** One to two, depending on the level of the athlete and number of repetitions.

Note: The session should be discontinued if the athlete can no longer reach the prescribed distance in the prescribed time.

Advantages

- Both anaerobic and aerobic benefits can be achieved.
- Develops the athlete's ability to change speeds, which is required in many sports.
- Great for developing aerobic capacity and aerobic power.
- Helps improve recovery rates.

Disadvantages

- Interval training can be very demanding on the body and lead to injury.
- Interval training can cause over-training if not monitored.

Examples of MAS intervals

Boxes

100 per cent MAS the length of the box, 70 per cent MAS the width of the box, each side completed in 15 seconds, one lap takes one minute, complete five laps (five minutes of work), two minutes' recovery between sets.

Straight line

120 per cent MAS in a straight line, covering target distance, two sets of 12–15-second efforts with 15 seconds' passive recovery, three minutes between sets.

Shuttle

110 per cent MAS shuttles over 20 metres (20 metres out, 20 metres back), covering target distance, two sets of 8–15 seconds, 15 seconds' recovery, three minutes between sets.

Figure 6.29 Distance runners and sprinters train differently resulting in significantly different body types

Figure 6.30 Javelin is an example of an anaerobic alactic sport

Anaerobic training (power and speed)

Anaerobic training is the dominant energy system for developing explosive power and speed, and is important for sports such as sprinting, jumping, changing direction, throwing and weightlifting, where sudden bursts of activity are required. Examples of sports that rely on explosive power include Rugby League, Rugby Union, AFL, soccer, basketball, cricket, track and field athletics, and baseball.

Anaerobic training involves high-intensity activities designed to develop both the alactic and lactate energy systems, and is best developed by utilising interval training. Anaerobic interval training involves higher intensities, shorter-duration efforts and longer rest periods compared with aerobic interval training.

Variations in the training completed by anaerobic athletes and aerobic athletes result in significant differences in body types.

Examples of anaerobic alactic sports include 100-metre sprinting, long and high jump, shot put, discus, javelin, Olympic lifting and the vault in gymnastics.

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Figure 6.31 Sprint cycling is an example of an anaerobic lactic sport

Examples of anaerobic lactic sports include 100-metre and 200-metre swimming, 400-metre hurdling and sprint cycling.

Team sports athletes utilise anaerobic interval training as part of their training during the pre-season in order to develop speed, power and agility.

Figure 6.32 Anaerobic interval training is used by team sport athletes to develop speed, power and agility

Going further 6.5

Inquire

Determine your own 110, 120 and 130 per cent MAS. Calculate the following running distances:

- **a 60-second run at 110 per cent of MAS**
- **a 30-second run at 120 per cent of MAS**
- **a 15-second run at 130 per cent of MAS.**

Summary 6.6

1. **Outline continuous training and provide examples.**
2. **Outline fartlek training and provide examples.**
3. **Outline long-interval training and provide examples.**

Checklist 6.7

1. **Design an aerobic training program for an athlete of your choice.**
2. **How might you measure and monitor the training adaptations gained from the various forms of aerobic training?**
3. **Identify safe training procedures for the various forms of aerobic training.**
4. **Identify potentially harmful training procedures for the various forms of aerobic training.**

Anaerobic power

Power is commonly referred to as speed strength, and refers to the ability to generate high levels of force as quickly as possible. It is a function of both speed and strength.

$$\text{Power} = \text{force} \times \frac{\text{distance}}{\text{time}}$$

Improvements in power (speed strength) can be achieved by altering any one of the variables (force, distance or time) while keeping the other two constant. Force is the result of the tension produced by a muscle during a muscular contraction, and allows it to fight inertia, move a mass and accelerate it. Without force-producing abilities, an athlete would be incapable of accelerating, rapidly changing direction or moving their body in space, basically because they could not move. Therefore, the development of the capacity to produce muscular force is crucial for successful athletes.

Figure 6.33 Plyometric exercises assist the movement involved with jumping

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Anaerobic speed

Speed refers to the quickness of limb movement, and is often assessed by determining the time between two points; however, for many team sports these two points are not necessarily in a straight line.

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

Speed is one of the most sought-after abilities among team and individual sport athletes, and is influenced by mobility, strength, power and technique. Therefore, speed programs must address all of these factors.

The way in which speed is developed depends on the appropriate 'sub-qualities' of speed that are relevant to the requirements of the sport. Types of speed or sub-qualities, according to Ian King in his 2000 work, *Foundations of Physical Preparation*, are:

- **Reaction time.** Reaction or quickness is the ability to react to a stimulus such as an opponent or one that may be auditory, visual or kinaesthetic.
- **Agility.** This is the ability to change direction rapidly while maintaining balance and coordination.
- **Acceleration.** Acceleration refers to the rate of change in speed over the first 10–15 metres or so.
- **Maximum speed.** Maximum speed is the highest speed attained by an athlete during a sprint – about 30 metres for a team sport athlete and 60 metres for a track sprinter.
- **Speed endurance.** This refers to the ability of the athlete to maintain speed over an extended distance, such as a 200-metre or 400-metre track athlete. For team sport athletes, speed endurance is the ability to repeat short sprint efforts with a limited drop in performance.

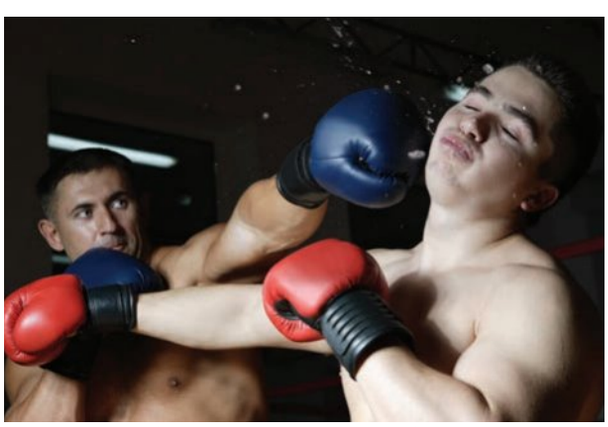

Figure 6.34 A boxer reacting to a punch

Figure 6.35 A soccer player changing direction

Figure 6.36 Athletes starting off the blocks at 10 metres

Figure 6.37 Usain Bolt

Figure 6.38 Michael Johnson

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Speed training guidelines

- **Mode:** Dependent upon the requirements of the sport.
- **Frequency:** Two to three sessions per week, with 48 to 72 hours' rest between sessions.
- **Intensity:** Very high – 95 per cent plus.
- **Distance:** For pure speed, 60 metres or less; for speed endurance, 60–300 metres.
- **Rest:** For pure speed, 1:10+, for speed endurance, 1:7.
- **Volume:** A maximum of 500 metres of volume for the entire session.

Sample speed session for a team sport athlete

First perform a thorough dynamic warm-up.

Drill	Sub-quality	Reps/sets	Rest
20 m hill sprints	Reaction and acceleration	4	1 minute
15 m agility sprints	Reaction, agility and acceleration	4	1 minute
Build 15 m sprint	Maximum speed	4	1 minute
25 m turn around	Repeat speed	5	30 seconds

Table 6.16 Sample speed session

Going further 6.8

Inquire

Purpose: Anaerobic speed testing
Tests: 35-metre speed test
Equipment: 35-metre tape measure, stopwatch, recording sheet and cones or markers
Test procedure: After a thorough warm-up and one practice sprint, record the time it takes to complete one maximal sprint over 35 metres. The starting position is a stationary standing position, with the foot behind the starting line. On the command 'Go', the athlete commences the sprint.

Compare your results to the table on the Top End Sports website (see www.cambridge.edu.au/hscpdhpe1weblinks).

Using speed training guidelines, create a training session designed to develop explosive speed.

Developing power through resistance/weight training

Power or speed strength is a function of speed and strength; therefore, the greater the strength the more power we can develop. Resistance-training programs designed to enhance power levels must incorporate elements of both maximum strength and explosive power development. Exercises must be performed as explosively and quickly as possible in order to increase the rate of force development (RFD) and stimulate the fast-twitch muscle fibres.

Faster players are capable of applying greater levels of force to the ground in less time compared with slower players. The result is greater power and faster acceleration.

Resistance training programs designed to develop explosive power include ballistic, speed-strength, strength-speed and maximal-strength methods. As stated previously, maximum strength development should be performed before explosive power.

Plyometrics

plyometrics jumps training or 'plyos'; an example of ballistic training

Plyometrics refers to jumps training or 'plyos', and is an example of ballistic training. Plyometrics is designed to improve the athlete's ability to apply more explosive force, and is an excellent method of converting gains in strength to explosive power and speed; therefore, it is most effective when it follows a maximal strength-training phase. By improving the athlete's maximum strength and force-producing capacity, greater opportunity exists to convert it into sport-specific power.

Plyometric training utilises the stretch-shortening cycle, which prompts the stretch reflex of the muscle during the eccentric phase, resulting in enhanced power during the explosive concentric muscular contraction. Examples of plyometric movements include hopping and jumping. For example, during double leg hops, the quadriceps preloads stored energy during the stretching (eccentric landing) phase, before explosively

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Figure 6.39 Plyometric exercise for both upper and lower body is common during Rugby League training

releasing the stored energy as the quadricep rapidly contracts during the concentric jump phase.

Plyometric exercises are a great way of mimicking the types of movement performed during sports such as sprinting, jumping, tennis, Rugby League, AFL, soccer, basketball, volleyball and boxing. Plyometric training is used regularly to prepare both professional and amateur adult athletes, while younger athletes can benefit from low volumes of low-intensity plyometric training. Correct program design and supervision are crucial in order to avoid injury. Pre-adolescent boys and girls should not perform plyometric exercises because of the increased likelihood of injury.

There are many forms of plyometric training that include both lower and upper body exercises. The choice of exercises should closely mimic the requirements of the sport. For example, sprinters, jumpers and soccer players often integrate lower body plyometric exercises into their training, while Rugby League, Rugby Union, baseball, tennis and volleyball athletes may utilise both lower and upper body plyometric exercises during training.

Plyometric exercise intensity

Plyometric exercises can be classified into low-, moderate- and high-intensity exercises, and should gradually progress from lower to higher intensity. This is most important in individuals with limited plyometric training experience.

Plyometric training guidelines

- **Mode:** Specific to the sport – for example, jumpers perform plyometric jump exercises while throwers perform plyometric throwing exercises.
- **Frequency:** Two to three sessions per week, with at least 48–73 hours between sessions.
- **Intensity:** Can include low-, moderate- and high-intensity drills.
- **Volume:** Refers to the number of repetitions (or ground contacts for lower body exercises) per session:
  - beginner: 60–80 ground contacts
  - intermediate: 80–100 ground contacts
  - advanced: 100–120 ground contacts.
- **Rest:** Plyometric training should be performed with maximal effort and speed, so rest should be sufficient to allow complete recovery. A work-to-rest ratio of at least 1:10 is recommended. For example, if a set of plyometric jumps takes 10 seconds, at least 100 seconds of rest should be taken.

Many explosive individual and team sport athletes adopt plyometric training to develop both speed and power.

Short-interval training

Short-interval training comprises shorter work efforts performed at a much higher intensity with longer rest periods compared with long-interval training. Unlike long-interval training, which is designed to improve the aerobic energy system, short-interval training is designed to target the ATP/PC energy system.

Going further 6.9

Inquire

Purpose: Anaerobic power testing

Test: Standing long jump test

Equipment: Measuring tape, sandpit, rake and recording sheet

Test procedure: After a thorough warm-up and two practice jumps, record your best standing long-jump distance in centimetres. The athlete stands behind the takeoff line with feet shoulder width apart and flat on the ground. Using a vigorous arm swing, the athlete takes a two-foot takeoff and attempts to jump as far as possible without falling backwards. The measurement is taken from the nearest heel to the takeoff line.

Compare your results with the table at Top End Sports (see www.cambridge.edu.au/hscpdhpe1weblinks).

Using the plyometric training guidelines, create a training session designed to develop your plyometric power. Discuss your plyometric training background, sport and examples of the exercises to support your training session.

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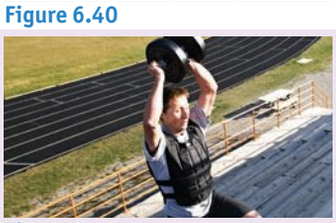
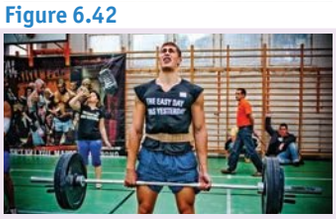
Power training method	Description	Picture example	Example of sport that uses method
Ballistic training method	Speed of movement is very dominant and resistance is extremely light	 Figure 6.40	Soccer
Speed-strength method	Speed of movement is still dominant; however, the resistance is about 10–20 per cent of maximum	 Figure 6.41	High jump
Strength-speed method	Athletes attempt to move the bar fast; however, the resistance is now higher – 30–70 per cent	 Figure 6.42	Rugby League
Maximum explosive strength method	Athletes attempt to move the bar fast; however, the resistance is now very high – 80–100 per cent	 Figure 6.43	Olympic lifting

Table 6.17 Examples of resistance training for power development

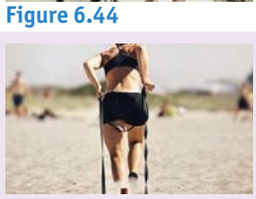
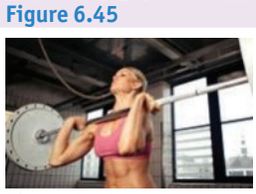
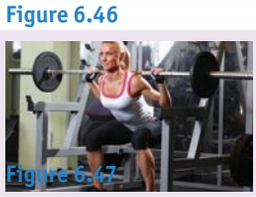
Training method	Sets	Reps	Load (% 1RM)	Rest	Speed	Exercise example
Ballistic method		5–20	0–10%	30 sec–2 min	Acceleration is very fast with minimal or no load	 Figure 6.44
Speed-strength method	5–15	6–10	10–20%	30 sec–2 min	Acceleration dominant and low mass	 Figure 6.45
Strength-speed method	5–20	3–10	30–70%	30 sec–2 min	Acceleration and mass contribute equally	 Figure 6.46
Maximum explosive strength method	5–15	1–5	80–100%	2–10 min	Mass is dominant and acceleration slow	 Figure 6.47

Table 6.18 Resistance training guidelines for power development

Source: Adapted from Christian Thibaudeau, *The Black Book of Training Secrets* (2000) & Ian King, *How to Write Strength Training Programs: A Practical Guide* (1998).

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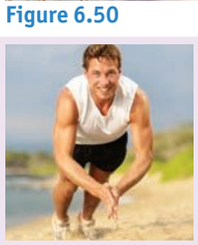
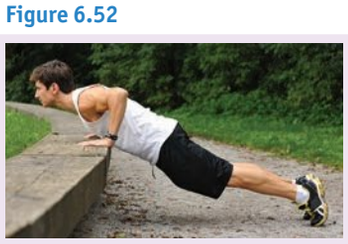
Exercise	Intensity	Picture
In-place hops	Low	 Figure 6.48
Lying med ball chest throw	Low	 Figure 6.49
Double leg hops	Moderate	 Figure 6.50
Plyo push-ups	Moderate	 Figure 6.51
Single-leg speed hops	High	 Figure 6.52
Elevated plyo push-ups	High	 Figure 6.53

Table 6.19 Intensity of various plyometric exercises

Week	Drills	Sets/reps	Rest between sets	Sessions per week
1 and 2	Four low-intensity exercises	2 × 10 for each exercise	2 minutes	2
3 and 4	Two low-intensity and two moderate-intensity exercises	2 × 10 for each exercise	2 minutes	2
5 and 6	Four moderate-intensity exercises	2 × 10 for each exercise	2 minutes	2
7 and 8	Two moderate-intensity and two high-intensity exercises	2 × 10 for each exercise	2 minutes	2

Table 6.20 Example of an eight-week plyometric program
Source: Adapted from Dintiman, Ward, Tellez, *Sports Speed*, 2nd edn. (2003).

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Figure 6.54 Many explosive individual and team sport athletes adopt plyometric training to develop both speed and power

Short-interval training is characterised by very high-intensity bursts of five to 10 seconds' work with a work-to-rest ratio of 1:5 or less. It is designed to improve the ability of the individual to tolerate lactic acid accumulation, so is useful for developing muscular speed, power, strength and sports-specific speed endurance.

Short-interval training can comprise short bursts of high-intensity resistance training gym circuits, body weight exercises, field sessions and cardio fitness equipment circuits designed to improve lactic acid tolerance.

Summary 6.10

1 Outline resistance training for power and provide examples.
2 Outline plyometrics and provide examples.
3 Outline short-interval training and provide examples.

Checklist 6.11

1 Design an anaerobic training program for an athlete of your choice.
2 How could you measure and monitor the training adaptations gained from the various forms of anaerobic training?
3 Identify safe training procedures for the various forms of anaerobic training.
4 Identify potentially harmful training procedures for the various forms of anaerobic training.

Flexibility training

Flexibility is defined as the range of motion about a joint or a series of joints. It is specific to a specific joint and group of joints. For example, an individual may have excellent hamstring flexibility yet limited shoulder flexibility. Adequate flexibility enables us to perform in our everyday lives; without it, our daily activities would become extremely difficult.

Some sports, like gymnastics, martial arts and dancing, require extreme levels of flexibility in order to meet the demands of the sport, so an extensive flexibility training program is designed to increase the range of motion required. For many sports, flexibility training is designed to ensure that an adequate range of motion is maintained, allowing the working muscles to maintain normal function.

Generally performed at the end of a training session, when the muscles are warm, flexibility training offers many benefits to the individual, including:

- reducing the risk of injury
- reducing muscle soreness
- reducing muscle tension
- enhancing movement efficiency and muscular coordination
- improving posture
- enhancing mental and physical relaxation.

Flexibility levels can vary between individuals, and a variety of factors affect flexibility, including:

- **gender** – females tend to be more flexible than males
- **age** – individuals lose flexibility with age
- **body size** – people with higher body fat levels have a harder time moving through a full range of motion
- **temperature** – the colder the weather, the more flexibility is limited

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Example of sports-specific short-interval training for a professional Rugby League team

During the course of pre-season training, professional Rugby League teams generally progress from longer, slower intervals designed to increase aerobic capacity to shorter, sharper intervals designed to challenge the athletes' lactic acid tolerance and repeat sprint ability. Professional Rugby League is a high-intensity, interval-based game comprising short, high-intensity efforts such as sprinting and tackling interspersed with low-intensity jogging, cruising, walking and standing. Short-interval training sessions consisting of wrestling, accelerations, decelerations and changes of direction with short recovery periods allow sports-specific conditioning to be achieved.

Sample short-interval training session

- **Session purpose:** Lactic acid tolerance training
- **Mode:** Circuit style set-up comprising high speed and agility, changes of direction, getting up and down off the ground and hitting pads.
- **Intensity:** Very high – 90 per cent plus
- **Interval duration:** 10 seconds
- **Recovery duration:** 30 seconds
- **Work-to-rest ratio:** 1:3
- **Repetitions:** 10 repetitions
- **Sets:** Two to three
- **Rest between sets:** Three minutes

- **injury** – limits range of motion
- **inactivity** – people who are inactive lose flexibility
- **training experience** – people with previous training experience tend to be more flexible.

Muscles contain sensory receptors within the muscle belly that detect changes in muscle length. When performed correctly, flexibility training can lessen the sensitivity of the muscles' sensory receptors to enable greater muscle relaxation and improved muscle fibre length.

Figure 6.55 Ballet requires extreme levels of flexibility in order to meet the demands of the sport

Types of flexibility training

There are three types of flexibility training recommended to improve flexibility, according to Ian King in his 2000 work, *Foundations of Physical Preparation*.

Static stretching

Static stretching requires the individual to 'hold' the stretch while the body is at rest. The seated adductor stretch is an example of a static stretch.

Static stretching involves the gradual lengthening of a muscle to a point of mild discomfort; it is then held in that position for a minimum period of 10 seconds to a maximum period of two minutes. The length of time for which a static stretch is held is in proportion to the number of muscle fibres being stretched. For example, the larger hamstring muscles require a longer static stretch in order to achieve muscle length compared with the bicep muscle. This is because larger muscles possess more muscle fibres.

Advantages

- Static stretching is most effective when adopted as part of the cool-down.
- Static stretching is usually safe and easy to learn, and can be used by virtually anyone.
- Once learned, static stretching can be performed almost anywhere and requires no real equipment.

Disadvantages

- Static stretching is only effective in improving flexibility at the specific body position and only to a small degree outside of that position.
- Static flexibility is limiting in its effectiveness for athletes or those wanting to increase flexibility in multiple ranges of motion.
- Static flexibility may best complement other forms of flexibility training.

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Dynamic flexibility

Dynamic flexibility involves moving parts of the body through a range of motion that gradually increases in range and speed. Examples include performing a walking lunge while gradually taking longer steps with each repetition, or performing shoulder circles while gradually increasing the range of motion with each repetition.

When performed correctly, dynamic stretching effectively warms up specific joints, helps reduce muscle tension and assists in the maintenance of current levels of flexibility, and should be the dominant form of stretching incorporated into the warm-up in many team and individual sports.

Dynamic flexibility guidelines

- Perform 8–12 repetitions for each exercise.
- Gradually increase the range of motion (ROM) for each exercise.
- Useful for dancers, swimmers, team sport athletes, and track and field athletes.

Advantages

- Dynamic flexibility is an extremely useful warm-up method for sports requiring a dynamic range of motion movements, speed and agility.
- Effective for stretching muscles that cross a joint.
- Stretches through a full range of motion.

Disadvantages

- Dynamic range of motion exercises should only be performed by athletes who have been shown appropriate exercises.
- Injury to joints, muscles and connective tissue can occur if inappropriate movements are used or movements are performed too fast, too soon or through too big a range of motion.

Ballistic stretching

Ballistic stretching occurs when rapid, repeated movements are performed to stretch your muscles slightly past their comfortable range of motion. They are used in the preparation of sporting events where explosive movements are required. Ballistic stretching is characterised by bouncing or jerking movements in and out of the end-range of motion, and can vary from the more rhythmical and smooth dynamic flexibility method – for example, bouncing toe-touch stretches.

Advantages

- When safely performed after a thorough dynamic warm-up, ballistic flexibility may be useful for explosive speed and power sports.
- Ballistic flexibility may be effective for increasing range of motion; however, the potential for injury is high.

Disadvantages

- Ballistic stretching forces muscles to contract, increasing the potential for injury.
- It should therefore be avoided unless the specific sport requires such movements; a thorough warm-up should precede ballistic movements.
- It can lead an athlete to stretch too far, possibly tearing or straining a muscle.

Figure 6.56 The Sydney Swans AFL football team demonstrate static stretching

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Figure 6.57 Hamstring stretch

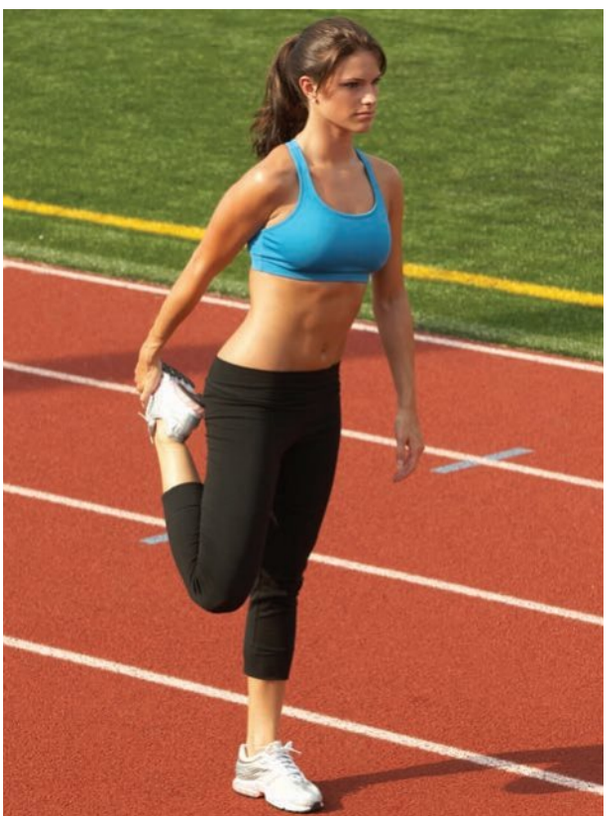

Figure 6.58 Quadricep stretch

Figure 6.59 Abdominal stretch

Figure 6.60 Hip flexor stretch

Going further 6.12

Inquire

How can static flexibility be measured?

Purpose: Test your lower body and upper body flexibility

Test 1: Sit-and-reach test

Equipment: Sit-and-reach box or a ruler and a box

Test procedure: The athlete sits on the floor with shoes removed, legs straight out in front, knees locked and flat against the floor, and the soles of the feet placed flat against the testing box. With one hand on top of the other and palms facing down, the athlete reaches forward, sliding the hands along the measuring line as far as possible, and holding the position for two seconds while the distance is recorded to the nearest centimetre. A score of zero is in line with the feet. A score beyond the feet would be a + score while a score before the feet would be a – score.

Compare your results with the table on the Top End Sports website (see www.cambridge.edu.au/hscpdhpe1weblinks).

Test 2: Shoulder flexibility test

Equipment: Measuring tape or ruler

Test procedure: Stand with your arms straight out by your sides. To test your left-side reach, flex your left elbow and reach your extended left hand down between your shoulder blades while simultaneously flexing your right elbow and reaching your right hand up between your shoulder blades. Record the distance between the two hands. Reverse the procedure to measure your right shoulder flexibility.

Compare your results with the table on the Top End Sports website (see www.cambridge.edu.au/hscpdhpe1weblinks).

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Figure 6.61 Dynamic stretching should be the dominant form of stretching incorporated into the warm-up of many team and individual sports

Summary 6.13

1 Outline static flexibility training and provide examples.
2 Outline dynamic flexibility training and provide examples.
3 Outline ballistic flexibility training and provide examples.

Checklist 6.14

1 Design a flexibility training program for an athlete of your choice.
2 How could you measure and monitor the training adaptations gained from the various forms of flexibility training?
3 Identify safe training procedures for the various forms of flexibility training.
4 Identify potentially harmful training procedures for the various forms of flexibility training.

Skills training

The ability of team and individual sport athletes to perform sport-specific skills efficiently and effectively is critical to achieving optimal performance. The best athletes in the world, such as Lionel Messi, Kobe Bryant, Serena Williams, Kelly Slater, Roger Federer, Stephanie Rice and Usain Bolt, all display the ability to execute complex skills in their chosen sports with precision while under extreme pressure.

While physical performance characteristics such as speed, power, strength and aerobic endurance are critical to athletic performance, it is the ability of the best athletes in the world to demonstrate superior skill, concentration and self-belief while under duress that sets them apart. Skill development and refinement provide the foundation from which more complex sporting skills are achieved, and they are the result of countless hours of time spent by both the coach and athlete practising and refining the skills necessary for their chosen sport.

Superior skill development is the direct result of quality skills coaching. Sports coaches are responsible for planning sessions, instructing sports skills, educating athletes on tactics and rules, providing appropriate performance feedback and evaluating the success of the skills training

program. Skills performed by athletes vary depending on the age, skill level and motivation levels of the athlete.

Some basic strategies for coaching include:

- Keep instructions simple and clear.
- Maintain a positive manner and use language appropriate to the participants.
- Keep the time spent on management tasks (setting up equipment and organising various drills) to a minimum.
- Keep young people active as much as possible.
- Keep instruction time for a specific skill to a minimum before participants are allowed to practise.
- Break complex skills into manageable chunks.
- Increase times, distances, heights and so on as skills improve.
- Make it more challenging by moving from static to dynamic, changing the number of players and introducing defenders.
- Practise under similar conditions to competition whenever possible.
- Give immediate, specific and constructive feedback.
- Question participants to ascertain whether instruction has been understood.

Source: Ausport (see www.cambridge.edu.au/hscpdhpe1weblinks).

Drill practice

Drill practice or skills training sessions refer to sport-specific training sessions where athletes repetitively practise the skills that are specific to the sport. Drill practice provides an opportunity to simulate an aspect of the game and develop new skills or refine those already learnt – for example, soccer players performing repetitive passing and trapping skills in order to refine technique and improve their technical skill level. Drill practice also provides an opportunity for the coach to assess the players' skill level.

Modern professional team sport coaches regularly combine both drill practice and fitness training in order to improve the athletes' fitness and skill levels. The result is a training session that is very specific to the demands of the sport.

Effective coaches are able to determine the appropriate level of difficulty of drill practice sessions in relation to the skill level of the athlete, and are able to gradually increase the level of difficulty of the sessions as the age, experience and skill level of the athletes increase.

During the early stages of skill learning and drill practice, the young athlete is trying to form a mental picture of how to perform the drill. When introducing a new skill to young beginner athletes, a coach should:

Figure 6.62 Kobe Bryant

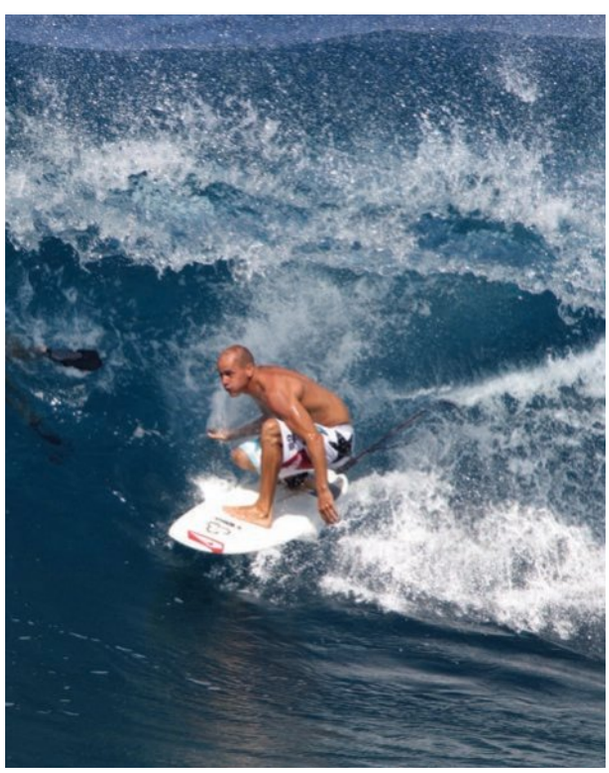

Figure 6.63 Kelly Slater

Figure 6.64 Serena Williams

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Figure 6.65 A soccer player practises kicking in a drill practice training session

- name the skill
- demonstrate the skill
- provide two or three key points
- demonstrate the skill again
- allow the athletes to practise the skill in a non-threatening environment using simple drills.

As the athletes' skill level progresses, movements become more fluent as they master basic skills; the complexity and intensity of the skills and drill practice sessions then increase, with sessions often comprising small-sided, sport-specific, game-related drills. After the exercise skill has been mastered, the coach is concerned primarily with reinforcing the correct technique and eliminating the incorrect technical flaws.

Modified and small-sided games

Modified and small-sided games are structured games and play, usually performed on a smaller field of play with fewer players than the real game – for example, a six-on-six game of small-sided soccer performed on a 50 m × 30 m pitch with small goals. Modified and small-sided games offer an excellent opportunity for players to have fun, develop the necessary skills of the game, apply skills within a game-specific situation, improve tactical awareness and develop the physical fitness characteristics required to compete in the sport.

Traditionally, physical fitness characteristics such as aerobic endurance were developed by interval running, swimming, cycling or any other method of cross-training. Modified skill-based conditioning games are now widely adopted as a method of athlete development among many elite-level team sport athletes. Skill-based modified and small-sided games are suitable for team sports, as they optimise training time by developing sport-specific skills, endurance, speed and agility in addition to increasing training specificity and reducing the risk of injury. Modified and small-sided games require athletes to think and make decisions under game-specific conditions, and perform sport-specific skills while fatigued.

The advantages of skills-based modified and small-sided games include:

Example of modified and smaller-sided games implemented into the physical preparation of an elite National Rugby League player

After a thorough warm-up and skills practice, players complete the following conditioning-based session:

- **Station 1:** six minutes of interval running, 30 seconds on, 30 seconds off
- Rest two minutes
- **Station 2:** six minutes of seven vs seven offsided touch football played on a 50 m × 70 m field
- Rest two minutes
- **Station 3:** six minutes of wrestling drills, 15 seconds on, 15 seconds off
- Rest two minutes
- **Station 4:** six minutes of seven vs seven touch football game played on a 50 m × 70 m field.
- Rest two minutes
- **Station 5:** six minutes of 30-second shuttle runs with 30 seconds' rest between repetitions.

Example of modified and smaller-sided games implemented among A-League soccer players

After a thorough warm-up, speed session and skills practice, players complete the following sample modified and small-sided game-based conditioning sample sessions:

- **Conditioning session 1:** nine vs nine game of soccer played on a 80 m × 50 m pitch, perform three 13-minute games with two minutes' rest between games
- **Conditioning session 2:** six vs six small-sided game of soccer played on a 50 m × 40 m pitch, perform four eight-minute games with two minutes' rest between sets
- **Conditioning session 3:** three vs three small-sided game of soccer played on a 20 m × 15 m pitch, perform two sets of six two-minute games of soccer with one minute's rest between games and three minutes' rest between sets.

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- increasing training enjoyment and motivation
- increasing training specificity (skills are transferred to a game-specific environment)
- developing teamwork and communication
- increasing player involvement
- developing game-specific fitness
- challenging skills under game-specific fatigue conditions.

Games for specific outcomes

Modern methods of elite team sport athlete development have seen a greater utilisation of skills-based modified and smaller-sided game implementation into training sessions in order to achieve specific outcomes.

Coaches often devise training games and modified skills-based smaller-sided games that are designed to develop the individual player's and team's:

- communication and decision-making skills
- defensive skills
- attacking or offensive skills
- team formations
- technical and tactical skill awareness.

Modern strength and conditioning coaches also utilise modified game variations in order to develop varying physical fitness components. For example, games performed on a larger field size with a larger number of players – such as 12 vs 12 – develop aerobic capacity and extensive endurance levels, while moderate field-size games played with a moderate number of players – such as six vs six – develop aerobic power and intensive endurance levels. Small-field games performed with small numbers – such as three vs three – develop repeat sprint ability.

Summary 6.15

1 Outline static drills practice and provide examples.
2 Outline modified and small-sided games and provide examples.
3 Outline games for specific outcomes and provide examples.

Checklist 6.16

1 Design a skills-based training program for an athlete of your choice.
2 How might you measure and monitor the training adaptations gained from the various forms of skills training?
3 Identify safe training procedures for the various forms of skills training.
4 Identify potentially harmful training procedures for the various forms of skills training.

Figure 6.66 Small-field games performed with small numbers – such as three vs three – develop repeat sprint ability

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6.2 Planning considerations for improving performance

Driving questions 6.17

Discuss your experiences of coaches that delivered highly planned, flexible, diverse and focused training sessions as well as coaches who made little effort in the preparation of their training sessions.

1 How did the players and team respond to each of these?

2 Why do you think this was the case?

Initial planning considerations

Success in any sport requires methodical planning, organisation, evaluation and commitment. It is widely accepted that failing to plan is planning to fail.

Effective planning in any competitive sport requires a thorough understanding of a variety of factors that impact on performance, including:

- the age of the athlete
- the experience of the athlete
- individual needs
- team requirements
- psychological factors
- skill requirements
- team tactics
- training equipment and resources
- length of the season
- environmental factors
- physical fitness requirements.

All of these factors must be appropriately addressed if optimal performance is to be achieved. Appropriate planning is difficult, as such periodisation is used to balance all aspects of physical, technical and practical preparation. Appropriate planning ensures that athletes are properly prepared for competition.

Performance and fitness needs

In order to effectively address the performance and fitness needs of athletes, it is critical that the coach possesses a thorough understanding of both the individuals' and the team's skill levels, training goals and physical fitness characteristics. Whether the athletes are beginners or experienced professionals, it is critical that the coach plans, organises, implements and evaluates both individual and team performances in order to gather appropriate information in an attempt to address individual and team goals and requirements.

Examples of performance data collected by professional Rugby League and football coaches include individual and team:

- strengths and weaknesses
- defensive statistics
- attacking statistics
- goals
- technical and tactical strengths and weaknesses
- training enjoyment
- pre-season and in season performances
- areas for improvement
- communication and leadership skills.

Coaches also need to consider:

- planning of training, venues, equipment and climatic considerations
- training and support staff.

Examples of the performance and fitness data collected by professional strength and conditioning coaches include:

- physical fitness tests – for example, speed, strength, power, agility and aerobic endurance testing; physical fitness data can be used to individualise training programs based on the strength and weakness of individual players
- postural screening – this is used to identify individual athletes' muscle imbalances, flexibility, mobility and stability concerns that may lead to injury risk
- injury history
- body composition (body mass and body fat)
- hydration levels and nutritional analysis
- individual physical performance needs and training goals
- individual and team training loads
- training and game heart rates, distances covered, numbers of sprints, impacts, accelerations and decelerations (GPS units are used to collect these data).

Good coaches regularly perform both team and individual performance appraisals in order to assess performance, provide feedback, assess both individual and team performance goals, and gain an understanding of the athletes' psychological states.

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Figure 6.67 Good coaches regularly perform both team and individual performance appraisals

Schedule of events/competitions

Effective sport-specific periodisation requires an understanding of the competition's commencement and conclusion dates. Establishing a clear understanding of the competition period ensures that the appropriate cycle of fitness, technical and tactical qualities has been addressed in an attempt to ensure optimal performance during the most important period of the season.

Team sports like netball, soccer, Rugby League, AFL, basketball and Rugby Union require weekly competition over an extended period of time, so players are required to peak weekly. Professional coaches spend countless hours assessing the players' daily and weekly training loads, muscle soreness, fatigue, sleep, stress, training enjoyment, heart rates and training distances in an attempt to ensure that they are not **over-training** or under-training in relation to the weekly training intensity and volume.

over-training refers to the physical, psychological and emotional state that occurs when the training comprises loads and intensities that exceed the recovery capacity of the athlete, resulting in a decline in fitness and performance

By adjusting training volumes and intensities, session types, session venues, recovery methods and rest periods, coaches can help maximise performance, avoid excessive overload and ensure that players are physically, socially and emotionally refreshed and ready to compete on a weekly basis, then peak for the final series.

Unlike team sport athletes, who have extended competitive periods, many individual athletes like swimmers, track athletes and cyclists have long periods of preparation with major competitions occurring periodically during their preparation. Athletes may be required to peak two to three times per year. For example, Olympic swimmers may be required to peak at the Commonwealth Games, Indoor World Short Course Championships, National Championships and Olympic Games. Coaches use smaller competitions and variations in training loads in an attempt to bring the athletes to a peak for the major competitions. In many Olympic sports, coaches design three- and four-year periodised programs designed to peak the athlete for the Olympic Games every four years.

Figure 6.68 Basketball players are required to compete on a weekly basis for an extended period of time

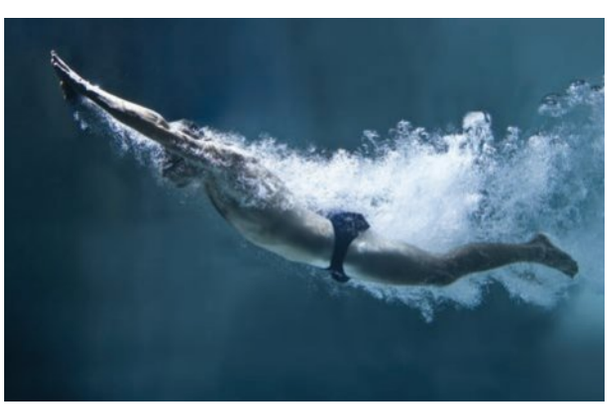

Figure 6.69 Olympic athletes need to compete at major championships like the Olympic Games every four years

Summary 6.18

Outline the initial planning considerations to improve performance with regard to:

- **fitness needs**
- **schedule of events**
- **climate and season.**

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Figure 6.70 NRL players are regularly tested for hydration levels to ensure the negative effects of dehydration do not impact sports performance

Climate and season

Planning and periodisation must take climatic conditions during the season into consideration. Strategies designed to counteract the negative effects of heat, cold, wind, rain and humidity on athletic performance must be put into place. A failure to acclimatise to these environmental conditions can place the body under stress, and significantly affect the athlete's performance.

For example, during the summer months of pre-season training, NRL and AFL coaches need to consider appropriate training attire, training times, player hydration, sunscreen and protective equipment in an attempt to counteract the effects of heat on performance.

Planning a training year (periodisation)

Planning a training year requires a great deal of preparation. It can be a difficult and time-consuming task, so to make the process easier, coaches use a method called periodisation.

Periodisation is the division of the training year into smaller and more manageable intervals with the goal of managing and coordinating all aspects of training to bring an athlete to peak performance at the most important competition, or of managing performance across a long in-season.

Effective periodisation requires planning, organisation, implementation and evaluation, and must take into consideration both individual and team strengths and weaknesses, and the physical, technical, tactical and psychological aspects of the sport.

Phases of competition

The three distinct phases of the competition season are:

- pre-season (preparation phase)
- in-season (competition phase)
- off-season (transition phase).

Pre-season (preparation) phase

The length of the preparation period is generally around eight to 12 weeks; however, this may vary, depending on:

- the type of sport – for example, soccer players generally have shorter preparation periods, while swimmers have longer preparation periods
- the length of the competition period – for example, basketballers have a long competition period while track cyclists have a shorter competitive period
- the age and experience of the athletes – professional A-League soccer players complete an extremely long preparation phase of 16–20 weeks pre-season while amateur soccer players have much shorter and less strenuous preparation periods.

Preparation period	
General preparation phase (19 November to 6 January) 7 weeks	Specific preparation phase (7 January until 3 March) 8 weeks
Competition period	
Pre-competition phase (4 March until 17 March)	Competition phase (18 March onwards)
Transition period	
End of competition period until start of next preparation period Also if a break between Xmas – New Year	

Table 6.21 An example of a competition season outline for an NRL Rugby League team

Source: Level 1 ASCA course notes, 2013.

Checklist 6.19

1. **Describe the specific considerations of planning for performance in events/competitions.**
2. **How would this planning differ for elite athletes and recreational athletes?**

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General preparation phase	Specific preparation phase
General physical fitness development	Training specific to the demands of the sport
Base aerobic conditioning development	Aerobic running maximised
General speed and agility technique	Game-specific fitness maximised
General hypertrophy and strength development	Strength and power maximised
General wrestling technique developed	Game-specific speed and agility maximised
Flexibility and mobility development	Game-specific wrestling fitness maximised
General skill development	Repeat sprint ability maximised
	Advanced technical and tactical development

Table 6.22 An example of the general and specific preparation phase training objectives for a contact sport athlete

During the preparation phase, the predominant energy systems relevant to the sport are developed to their maximum capabilities, and the technical and tactical skills are refined as the competition period approaches.

The preparation period can be divided further into two distinct phases:

- **General preparation period.** The objective of the general preparation phase is the development of fitness and general technical skill development.
- **Specific preparation period.** The objective of this phase is to maximise the specific fitness qualities relevant to the sport.

The specific preparation phase generally concludes with a pre-competition phase of training, providing an opportunity for athletes to play trial games in preparation for the in-season phase.

In-season (competition) phase

The in-season, or competition, phase is structured around the specific competition calendar, and varies significantly between different sports. Regardless of the sport, the goal of the competition period is to maintain the fitness qualities developed during the preparation period and allow the minor competitions to bring the athlete to peak performance during the main competition.

The in-season period requires considerable collaboration between coaches, medical staff and the athletes in order to avoid injury and achieve peak performance. Coaches and support staff spend considerable time assessing the athlete's performance level, tactics, equipment changes, nutritional plans, travel arrangements, training loads, weekly schedules, muscle soreness and fatigue levels. Data collated allow the coaches to adjust weekly training loads. During higher priority competitions such as the final series and grand final common to team sports, or national championships, world championships and Olympic Games for many Olympic sports, there is a definite taper stage or freshening-up period during peaking periods, while lower priority competitions might simply be integrated into a normal training week.

Off-season (transition) phase

The off-season, or transition, phase of the yearly training plan varies depending on the requirements of the sport, and the age and experience of the athlete. While the transition period generally lasts for three to five weeks for professional athletes, part-time athletes may take three months or more off at the completion of the season.

The off-season allows the athlete sufficient time to recover physically from the rigors of training and competition, in addition to providing an opportunity to relax psychologically as well as overcome any niggling injuries or muscle soreness accumulated during the season. This is the perfect time of the year for athletes to take a break, enjoy themselves and go away on holiday. It can be divided into two distinct periods.

The first phase, commonly of one or two weeks' duration, involves complete rest and rejuvenation. The second phase, defined as the active rest phase, provides an opportunity for athletes to commence general cross-training at a low intensity and volume. The active rest phase, while still providing athletes with a physical and psychological break from the usual training and competition demands of the sport, allows them to maintain an acceptable level of general fitness through cross-training.

When conducted successfully, the transition period should ensure that athletes return to training fully regenerated and ready to recommence the more structured sport-specific preparation phase of training.

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Sub-phases (macro- and micro-cycles)

The macro-cycle

macro-cycle the long-term annual plan for the entire season

The **macro-cycle**, or annual plan, refers to the long-term annual plan for the entire season that works towards peaking for the main competitive goal of the season. The macro-cycle comprises the three phases already discussed:

- preparation phase (general and specific)
- competitive, or in-season, phase
- transition, or off-season, phase.

The meso-cycle

A meso-cycle of training generally represents a two- to six-week phase of training during the annual plan; however, this can vary depending on the sport, age and experience of the athletes. While a meso-cycle may last two to six weeks during a preparation period, it may be as short as two to four weeks during the competition period, depending on the competition calendar.

Table 6.24 shows an example of a four-week meso-cycle for a sprinter, where the weekly training load increases from Weeks 1 to 3, while Week 4 is a download week. During the download week, the volume of training drops to allow regeneration and super-compensation.

The micro-cycle

A **micro-cycle** refers to the smallest block of training, and typically comprises a week of training. Multiple micro-cycles are joined together to form a meso-cycle. The micro-cycle is then broken down into individual daily session plans.

micro-cycle the smallest block of training, typically comprising a week of training

Peaking

Training for peak performance is a complex process that requires considerable planning, preparation and evaluation. In order to achieve peak performance, the athlete must be able to adapt to the volume and intensity of the various training components and methods of training.

Thorough athletic preparation that balances both the volume and intensity of training results in athletes who display an improved work capacity, physical fitness, technical and tactical proficiency (neuromuscular coordination), physical health and a psychological state of readiness, confidence, excitement, enjoyment and anticipation in preparation for competition. Athletes often describe themselves as being in 'great shape' during the competition phase of training.

peaking achieved when the athlete has reached a state of optimal physical, psychological, emotional and spiritual health and well-being

Peaking is achieved when the athlete has reached a state of optimal

Annual training plan for a winter team sport

Macro-cycle	Pre-season			In-season		Transition
Meso-cycle	General preparation	Transition	Specific preparation	Pre-comp	Competition	Transition
Micro-cycle	Weeks 1, 2, 3, 4, 5, 6	1 week	Weeks 8, 9, 10, 11, 12	Weeks 13–16	26 weeks + four-week final series	Six weeks

Table 6.23 Annual training plan for a winter team sport

Four-week meso-cycle for a sprinter

Weeks	1	2	3	4
General preparation weekly load				

Table 6.24 Example of a meso-cycle for a winter-based team sport

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General preparation weekly micro-cycle						
Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Mobility	Mobility	Rest	Mobility	Mobility	Mobility	Rest
Speed and agility	Team skills		Speed and agility	Team skills	Aerobic Condition Skill games	
	Aerobic capacity			Aerobic capacity		
Group skills	Wrestle		Group skills	Wrestle		
Gym	Gym		Gym	Gym		
Stretch	Massage		Stretch	Massage		

Table 6.25 An example of a one-week micro-cycle for a professional National Rugby League player during the general preparation phase

physical, psychological, emotional and spiritual health and well-being. The athlete has adapted to the work and recovery demands, and super-compensation has been achieved.

Generally, prior to the main competition, an unloading phase of training is implemented, and this is critical to achieving peak performance. During this period, the volume and intensity of training are reduced and the athlete is unloaded (tapering). Proper unloading results in a heightened state of readiness. A short-term peaking period is achieved through super-compensation.

Tapering

Critical to peak performance is the taper period of training. It is during this period that the coach's and athlete's periodised training program is tested, as the athlete prepares for the major competition of the season.

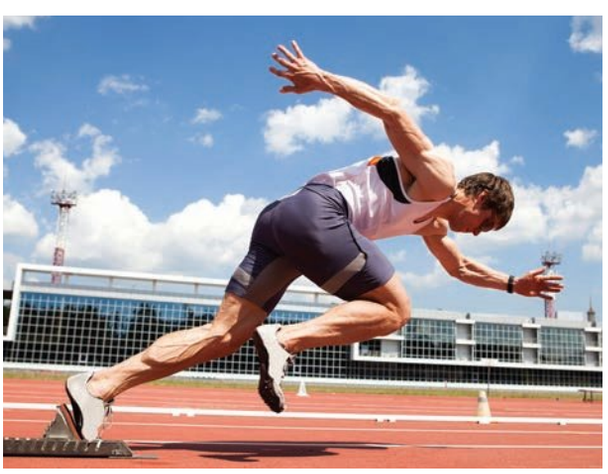

Figure 6.71 Sprinters require six to 10 races in order to peak for a major competition

Tapering for sports performance refers to a period of reduced training load in the days and weeks leading up to the main competition, in an attempt to promote 'peak' performance at the most vital time.

tapering a period of reduced training load in the days and weeks leading up to the main competition in an attempt to promote 'peak' performance at the most vital time

Tapering allows for the replenishment of muscle glycogen, neuromuscular and metabolic system regeneration and an elevation of hormone levels – all of which are depleted during intense training periods. Adequate taper periods allow for a decrease in training stress and an optimal state of recovery and regeneration. During this period, the body is rested for an appropriate period of time while fitness is maintained. The drop in fatigue while maintaining fitness results in increased performance:

Performance = fitness – fatigue

Taper periods are common in many sports such as swimming, cycling, running, jumping, throwing, team sports and endurance sports, and can last for several days and up to a week or more for some sports.

Taper guidelines

General guidelines for a successful taper include:

- dropping the total training volume by 50 to 70 per cent
- keeping high-intensity training levels high but volume low during the taper
- reducing the difficulty of training
- increasing the recovery periods during training
- reducing the frequency of training sessions by up to 20 per cent

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Figure 6.72 Swimmers will taper for a week or less prior to a major competition, while explosive sprinters may taper for two weeks or more in preparation for a major competition

- keeping the taper between four and 21 days, depending on the individual and the sport's requirements
- keeping the activities performed during the taper specific to the competitive demands of the sport.

Source: Adapted from Ausport (see www.cambridge.edu.au/hscpdhpe1weblinks).

Sport-specific sub-phases

Sub-phases can be geared specifically to the time of the season, and particularly the needs of the athlete in that phase of the season. Various sports will have different needs for skills and fitness at different times of the year. Therefore, the sub-phases will be specific to the demands of the sport and the needs of the athlete. Sports that do not require large muscle mass will not focus on this area, while sports that are dominant in the area of cardiovascular endurance will have more sport-specific sub-phases built around developing and maintaining this.

Summary 6.20

1 Briefly outline the three phases of competition and what occurs during each phase.
2 Describe macro-cycles, meso-cycles and micro-cycles. Provide examples.
3 What is peaking, and how do athletes/teams plan to peak?
4 What is tapering, and what are the key elements of a 'good' taper?

Checklist 6.21

1 Develop a periodisation chart for the fitness and skill-specific requirements of a sport of your choice.
2 Justify the periodisation of the various requirements of that sport.

Elements to consider when designing a training session

Health and safety considerations

Considering the health and safety of the athlete is an integral component of effective planning and preparation. Coaches and officials must consider the following health and safety recommendations:

- **Environmental factors.** Extreme heat, cold, wind, humidity and rain can all have a significant impact on the performance of the athlete. During hot, humid conditions, a failure to appropriately hydrate or wear suitable protective clothing and equipment can result in injury and illness. Likewise, playing and training during extremes of cold without considering appropriate insulation can result in hypothermia. Children in particular are susceptible to extremes in temperatures. Extreme weather conditions may require rescheduling, particularly during lightning storms.

Figure 6.73 Marathon runners may taper for two to three weeks in preparation for a major competition

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- **Clothing and apparel.** Appropriate clothing can help counteract the effects of extreme weather conditions. Sunscreen, sunglasses, hats and protective apparel help counteract the extreme effects of heat. Wet-weather clothing, beanies, warm clothing and insulation such as wetsuits help counteract the effects of cold, rain and wind.
- **Protective equipment.** Appropriate protective equipment, such as mouthguards, shin pads, shoulder pads, helmets, protective footwear, gloves, wrist guards, elbow guards, wetsuits and protective eyewear all minimise the risk of injury.
- **Training ground and sporting facilities.** Regular checks of the playing surface should be made for glass, holes, exposed sprinkler heads and dangerous worn areas. In addition, the dressing rooms should be kept clean and hygienic, and free from clutter and litter. Additional protective padding to goalposts, adequate lighting and protective fencing should be checked regularly to avoid the risk of injury.
- **Injury protection:** Effective warm-ups and cool-downs are integral to minimising the risk of injury. Individualised player medical and physiotherapy screening can help expose muscle imbalances, mobility and stability issues, and enable the implementation of personalised pre-hab and strength-training programs for injury prevention. The correct lifting technique and the proper use of equipment help reduce injury risk, while appropriate supervision and the monitoring of players' training loads all help minimise injury risk.

Providing an overview of the session to athletes

Great coaches are effective communicators and collaborators. They provide a clear explanation of the goals and expectations of the season, and ensure that the players take ownership of the team's goals and expectations, and that the long-, medium- and short-term goals are regularly planned and evaluated. At the conclusion of the season, coaches review the performances through group and individual meetings, assess the strengths and weaknesses of the team and individuals, and use that information to set team and individual goals and put plans in place to address weaknesses and improve strengths.

Warm-up and cool-down

Warm-up

Warm-up comprises the processes associated with elevating core temperature and preparing the body, both physiologically and psychologically, for training or sport. The warm-up is the first part of any training session or preparation for competition, and should involve active motion activities that progress from low to moderate and eventually sport-specific intensity. A thorough warm-up should cover all muscles and movements specific to the chosen sport.

Effective warm-ups:

- increase core temperature
- increase respiratory and heart rate
- increase range of motion and ease of movement
- increase metabolic rate

Example of a warm-up routine for a National Rugby League team

- Increase core temperature (three minutes).
- After two minutes of the players' own time to do what they need, the team comes together to complete two to three minutes of a steady catch and passing drill, running back and forth over 10 metres.
- Players are provided with a couple of minutes to statically stretch what they feel they need to stretch (static stretching is not the focus of the dynamic warm-up).
- One-minute drink break.
- Increase range of motion (four minutes).
- Players complete dynamic mobility drills over 10 metres, including lunges, side-lunges, sumo squats, hip rotations, glute bridges and push-ups.
- Players complete two minutes of dynamic leg swings for hamstrings, adductors, hips and upper body.
- Players complete three 30-metre runs, gradually building speed.
- Sport-specific ball skills (eight minutes).
- Forwards and backs separate and complete specific skills relevant to the positional group.
- One-minute drink break.
- Speed, agility and power exercise (three minutes).
- Players complete standing wrestling, line speed and hitting bump pads, and two to three sharp accelerations over 20–30 metres.
- Total warm-up time: 20 minutes.

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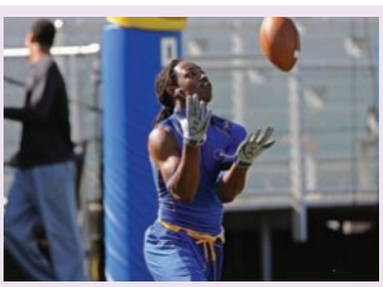
Phase	Description	Time	Example
1 Increase core temperature	The first part of the warm-up is designed to elevate the core temperature, and comprises light aerobic activity such as jogging, backward running, skipping, rowing, cycling or light aerobic skill drills using the ball, which help increase the core temperature and promote a light sweat.	2–4 minutes	 **Figure 6.74** Warm-up
2 Static stretching	While static stretching may assist in improving static flexibility, it is not as effective in preparing the athlete to move dynamically, which is common with many sports; therefore, extended periods of static stretching are not required during the warm-up, with a greater focus instead on dynamic mobility exercises. Static stretching in the warm-up should cover all major muscle groups, and helps to: • reduce muscle tension • increase muscle and tendon length • promote circulation • make you feel good • develop body awareness. It should be limited to holds of no longer than 10–30 seconds. Examples of static stretches are calf, hamstring, groin, quadriceps, gluteal and upper body stretches.	2–5 minutes	 **Figure 6.75** Static stretching
3 Establish range of motion (dynamic mobility and flexibility drills)	Dynamic mobility and flexibility exercises help prepare the body for the more specific dynamic movements that make up the main part of the warm-up by preparing the muscles, tendons, joints and nervous system dynamically. Examples of dynamic flexibility exercises include walking hamstring stretches, knee to chest, walking lunges, side lunges, squats, sumo squats, push-ups, leg swings, arm swings and hip circles.	4–8 minutes	 **Figure 6.76** Dynamic mobility exercises
4 Sports-specific ball skills (if appropriate to the sport)	Sport-specific skills progress to specific skill activities. Skill drills allow the athletes to 'get their eye in' by practising skills that have already been learnt. Examples of skill drills adopted in the warm-up in Rugby League include catch and pass, defensive shape, play the ball speed and simple plays that gradually increase in difficulty and intensity.	6–10 minutes	 **Figure 6.77** Sports-specific ball skills
5 Speed, agility and power exercises (if appropriate to the sport)	Short, low-volume speed and agility drills fire up the nervous system and finish the warm-up perfectly. Four to five repetitions of maximal or near maximal short sprints incorporating the ball, change of direction and reaction exercises. For impact sports, tackling and impact exercises can be incorporated here.	2–3 minutes	 **Figure 6.78** Speed, agility and power exercises

Table 6.26 Phases of a general warm-up

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Example of a traditional ineffective warm-up for a team sport athlete

- Jog two laps of the oval.
- Sit down and perform static stretching.
- Start the session.

Problems with this form of warm-up

- Inadequate physical preparation for team sports.
- Not effective for high-power activities.
- Not effective for changes of direction or impact.
- No skill preparation or practice.

- practise/prepare the nervous system for high-powered activities
- practise already learnt skills with high frequency
- prepare further for skill and tactical performance.

Cool-down

The cool-down refers to the gradual processes associated with decreasing core temperature and reducing the neural and physiological state of the body after training or sport.

Cool-downs comprise low-intensity activity such as jogging, followed by static stretching. They help remove lactic acid, speed up the recovery process, promote muscle relaxation, reduce soreness and help relax the athlete.

An effective cool-down consists of three to four minutes of light activity to help reduce core temperature. It could incorporate jogging, walking, functional mobility exercises such as lunges, lateral lunges, knees to chest, walking hamstring stretches and/or very light basic skills with the ball, followed by whole-body static stretching.

Skill and instruction practice

The purpose of practice is to prepare the athletes for competition. Effective coaches must ensure that skill instruction and practice are designed to ensure this purpose is being met.

Effective skill instruction and practice require considerable planning, organisation and communication. Coaches are responsible for providing clear instruction regarding sports skills, teaching teamwork and cooperation, providing appropriate feedback, helping to improve skills and evaluating the success of the sessions.

Guidelines for effective skill instruction

- Instruction should be brief, simple and clear.
- Ensure the language is appropriate to the age and level of the athletes.
- Be positive and enthusiastic when providing instruction.
- Ensure feedback is immediate and positive.
- Keep instruction time for a specific skill short, so athletes can maximise practice time.
- Use demonstration to support the instruction, so players can see, hear and then feel the movement through practice.

Guidelines for effective practice

- Ensure skill practice is appropriate to the age and level of the athletes.
- Vary practice between individual, partner and group practice.
- Increase the complexity of the skill practice as athletes progress in skill level.
- Move from simple to more complex skill practice.
- Practise skills in short three- to five-minute blocks during the session.
- Practise skills under similar conditions to competition requirements.

Conditioning

In order to effectively integrate conditioning training within a training session, it is imperative that the coach determines the training units to be completed within the training session – for example, warm-ups, skill drills, speed and agility, games skills, aerobic conditioning and cool-down – and assigns the appropriate training units in the correct order within the timeframe of the session.

When designing conditioning programs within a training session, the correct sequence of the integration of conditioning components within the training session is as follows:

- Warm-up is the first priority within the session.
- Strength/power, speed/agility and skill/tactical training components should be completed next.
- Aerobic conditioning training is implemented after high-intensity training.
- Cool-down, incorporating flexibility training, is completed last.

It is not uncommon for coaches to incorporate skill/tactical training in between components of conditioning, as this provides an opportunity for players to challenge skills and decision-making under fatigue conditions.

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Example of a training session for a part-time team sport player

- 0–8 minutes: Warm-up including mobility exercises and basic skill drills
- 8–15 minutes: Speed and agility
- 15–60 minutes: Sport-specific skills and tactics
- 60–70 minutes: Conditioning (if required)
- 70–75 minutes: Cool-down

The length of the training session and the volume of conditioning work performed during the in-season period are shorter in the competition phase of the season, compared with the preparation phase of training.

For part-time athletes, shorter sessions are required, as they do not have access to the same recovery modalities as those available to full-time athletes. For part-time athletes, the total session length may be around 70–90 minutes.

Summary 6.22

Outline the elements that need to be considered when designing a training session.

Checklist 6.23

1 **In what ways can training sessions be structured?**
2 **Design (and implement) a training session for a specific event. Upon completion of the sessions, evaluate the following:**
   - **Did the activities match the abilities of the group?**
   - **Did the group enjoy the session?**
   - **How could you have modified or improved the session?**

Evaluation

Evaluating training allows the coach to monitor the effectiveness of training and to determine whether the goals, aims and objectives of training are being met. Following training sessions and at the conclusion of blocks of training, coaches use evaluation to:

- collect input from the players to determine the level of training enjoyment and satisfaction
- determine whether training session goals have been achieved
- monitor the success of specific training blocks
- monitor the athletes' understanding of the training aims and objectives
- monitor player training loads
- assess the effectiveness of training programs with fellow coaches and support staff
- make decisions in relation to future training guidelines
- gather information from parents and guardians regarding athletes' welfare issues and general training enjoyment
- ensure all players, coaches, parents and guardians clearly understand session times, game venues, playing times and travel arrangements
- identify player and team technical and tactical strengths and weaknesses
- assess the physical fitness strengths and weaknesses of the team
- evaluate their own coaching performance.

Planning to avoid over-training

Over-training refers to the physical, psychological and emotional state that occurs when the training comprises loads and intensities that exceed the recovery capacity of the athlete, resulting in a decline in fitness and performance.

Coaches who fail to balance appropriate training loads with adequate recovery, and fail to effectively monitor their athletes' adaptation to the training program, run the risk of causing chronic over-training, resulting in poor performance and a loss of training enjoyment.

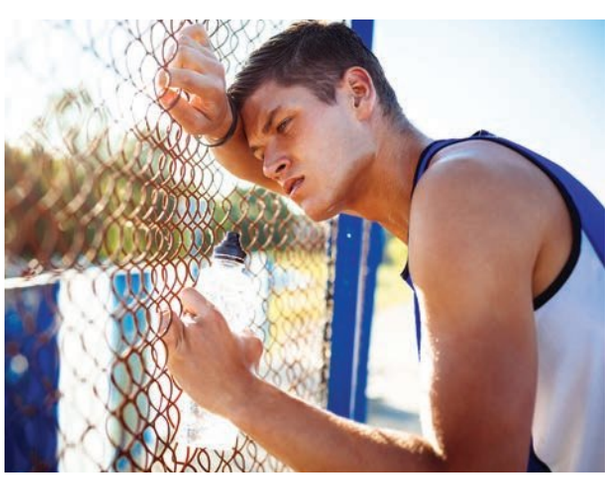

Figure 6.79 Over-training can lead to physical, psychological and emotional fatigue

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Coaches also need to understand how different forms of training, such as speed, skill, aerobic and strength training, have varying impacts on the athlete and require a range of recovery times. For example, high-intensity anaerobic training, such as sprinting, strength training and power training, can place significant stress on the musculoskeletal and central nervous systems, and generally requires 48 to 72 hours between sessions in order to recover. In contrast, aerobic training – while demanding on the cardiovascular system – has minimal impact on the central nervous system, and generally requires only 24 hours' recovery.

It is the role of the coach to quantify the impact of the various forms of training on the athlete's ability to adapt and recover, and the coach can apply appropriate training loads and provide the necessary recovery time in order to allow the super-compensation process to take place.

Amount and intensity of training

Coaches need to be able to quantify the impact that training load and intensity have on the athlete, in order to avoid the negative impact that chronic over-training can have on training and competition enjoyment, desire and performance. By monitoring training loads, coaches are able to apply appropriate training loads and effectively plan training, resulting in better training and competition performance, and general enjoyment of the sport.

Example of monitoring training loads for athletes

Many modern coaches adopt a method called rate of perceived exertion (RPE). RPE was devised to monitor the training load for many forms of training such as speed, strength, power endurance and skill training. RPE's methods of monitoring training loads are being adopted by many AFL, soccer, Rugby Union, Rugby League and individual sport athletes in Australia today.

Determining RPEs for a session

Players rate the difficulty of a session from 1 to 10: 1 = very, very easy, 5 = hard and 10 = maximal. The player's RPE is multiplied by the length of the session in minutes. For example, an RPE of 5 × 60 minutes = a load of 300. Players' training loads are recorded for each session of the week.

All players' weekly training loads are monitored, along with muscle soreness, fatigue levels and sleep quality. This information is used to apply/adjust training loads for the week.

Training loads will vary significantly between professional and amateur athletes. Professional athletes perform significantly more training and experience considerably higher workloads compared with amateur athletes, so the management of training loads and recovery is a necessity for professional-level coaches.

Physiological considerations

Coaches need to be aware of a variety of physiological signs of over-training, including:

- a drop in performance
- chronic muscle soreness
- difficulty sleeping
- persistent fatigue and a feeling of **lethargy**
- rapid weight loss
- body fat loss
- frequent colds and infections
- increased incidence of injury
- increased resting heart rate

lethargy
persistent fatigue

	Type	RPE	Duration	= Unit load	Daily load
Monday	Strength Conditioning/skill	6 7.5	30 60	= 180 = 455	635
Tuesday	Strength Skill/tactics	6 5	30 45	= 180 = 225	405
Wednesday	Off				0
Thursday	Strength Speed/skill	5 6	40 45	= 200 = 270	470
Friday	Skill/tactics Conditioning	6 8.5	40 30	= 240 = 255	495
Sat/Sun	Off				0
Weekly total					2005

Table 6.27 Intensity and training loads

Source: Level 1 ASCA course notes.

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- loss of muscular strength, speed and power
- loss of aerobic capacity
- delayed recovery
- early onset of fatigue
- inability to complete workouts
- lower testosterone levels in males
- infrequent menstruation cycles in females.

Psychological considerations

In addition to physiological considerations, in avoiding over-training coaches must be aware of various psychological signs of overtraining, including:

- a loss of training and competition enjoyment, motivation and drive
- feelings of depression
- a loss of enthusiasm, desire and drive
- frequent mood disturbances
- feeling irritable
- loss of appetite.

Summary 6.24

1 Outline the impact of and relationship between the amount and intensity of training with regard to potential over-training of athletes.
2 What are the physiological considerations to be aware of in terms of over-training?
3 What are the psychological considerations to be aware of in terms of over-training?

Checklist 6.25

1 How much training is too much?
2 How do you identify an over-trained athlete?
3 What would you do if you identified an over-trained athlete?
4 How might over-training be avoided?

Figure 6.80 Athletes and coaches must be aware of the physiological and psychological effects overtraining can have

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6.3 Ethical issues involved in improving performance

Driving questions 6.26

1. Identify the major differences in the world of sport today to the world of sport fifty years ago.
2. What are some of the negative effects of the changes that have occurred?
3. What are some of the pressures that lead athletes to use drugs to illegally enhance their performance? Are they solely responsible for their mistakes?

Use of drugs

The use of performance-enhancing drugs is commonly referred to as doping, and is considered both illegal and unethical by the International Olympic Committee (IOC), as it goes against the true spirit of fair and equal sport participation. Many international sporting bodies support the strong stance taken by the IOC in the fight against drugs in sport, and set their own sanctions against any individuals who are caught doping.

The dangers of performance-enhancing drug use

Competitive athletes face significant pressure to succeed. The competitive will to win, combined with the adulation involved in being in a professional team, representing your country, winning medals and experiencing the personal fulfilment and financial rewards associated with sporting success, is strong; however, the risks of performance-enhancing drug use far outweigh any perceived benefits to the athlete.

anabolic steroids the illegal performance-enhancing drugs most closely linked to the development of explosive, strength, speed and power

The physical effects of performance-enhancing drugs include cancer, liver and kidney tumours, viral infections and diseases such as hepatitis and HIV, acne, heart problems, high cholesterol, sexual dysfunction and high blood pressure.

Performance-enhancing drugs (particularly **anabolic steroids**) are linked with many psychological and emotional health problems that can include depression, anxiety, aggression, rage and violence.

Socially, athletes who test positive lose their reputations and destroy both sponsorship and financial opportunities, and ultimately even their careers.

See the article 'Armstrong faces $200 million salary loss with reputation hit' on the Bloomberg website (go to www.cambridge.edu.au/hscpdhpe1weblinks).

Drug use for strength

Anabolic steroids, including testosterone and human growth hormone, are the illegal performance-enhancing drugs most commonly connected with the development of explosive strength, speed and power in sports such as weightlifting, sprinting, explosive jumping and throwing events, and body-building.

Anabolic steroids, including testosterone

Anabolic steroids – also known as anabolic-androgenic steroids – have similar effects to testosterone in the human body. Anabolic steroids have both anabolic muscle-building properties, through stimulating protein synthesis within skeletal muscle, and androgenic properties, including the development of male characteristics

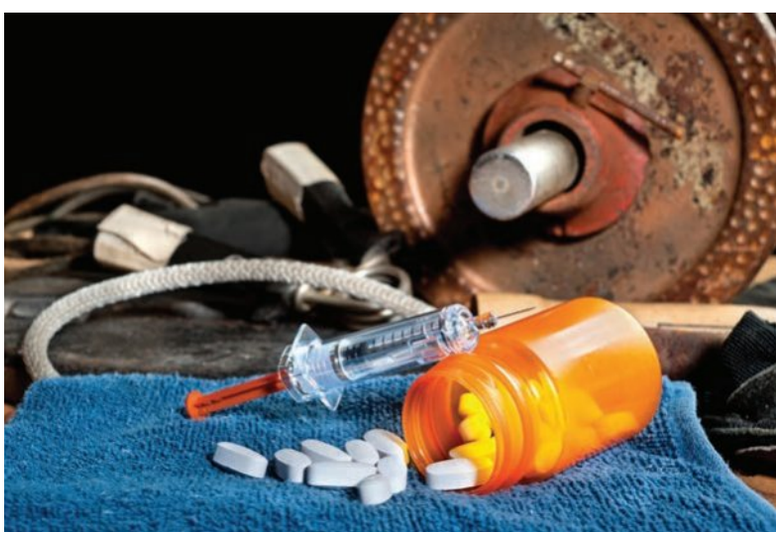

Figure 6.81 Competitive athletes face significant pressure to succeed, but the risks of performance-enhancing drug use far outweigh any perceived benefit to the athlete

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such as facial and body hair, deepening of the voice and an increase in testosterone levels.

The negative side-effects associated with anabolic steroid use include physiological side-effects such as male-pattern baldness, acne, liver damage and stunted growth when used by teenagers. Males can experience impotence, reduced sperm count, testicular shrinkage and female breast tissue development. Females may develop facial and body hair, a deepening of the voice, a disrupted menstrual cycle, loss of breast development and an enlarged clitoris. Psychological side-effects include abnormal sexual function, aggression, depression, mood swings, violence and in some cases suicide.

Figure 6.82 Potential negative side-effects of anabolic steroid use

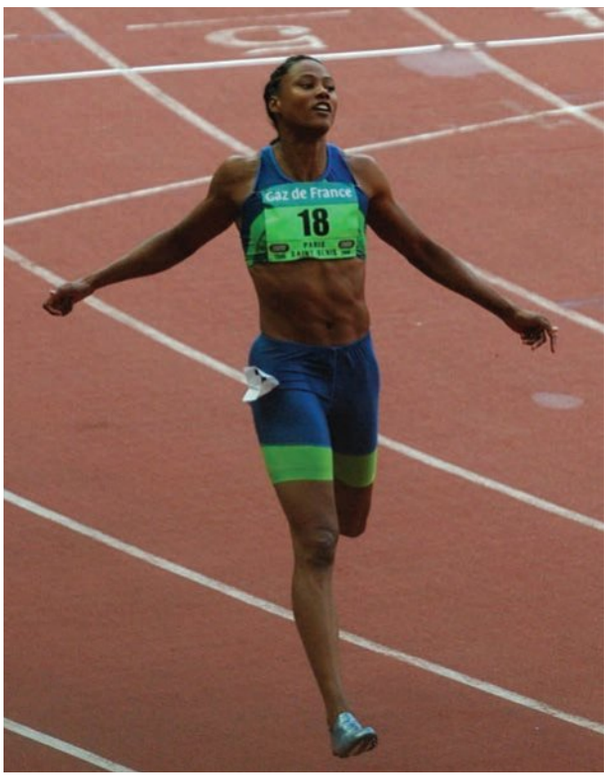

Figure 6.83 Sprinter Marion Jones confessed that she had taken performance-enhancing drugs and forfeited all medals

Peptide hormones

In recent times, the alleged use of peptide hormones among team sport athletes in Australia has taken up considerable space and time in the media, due to allegations against the Essendon AFL Football Club, the Cronulla Sharks Rugby League Football Club and the admission of Rugby League player Sandor Earl that he had taken the banned peptide CJC-1295.

Until recently, peptide hormones were undetectable, and had not been included in the World Anti Doping Agency (WADA) list of banned

Figure 6.84 The illegal peptides GHRP-6 and CJC-1295 have been linked to issues surrounding the alleged peptide use among team sport athletes in Australia

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substances. Peptides work by stimulating protein synthesis within the body, promoting muscle growth and recovery.

Human growth hormone

Human growth hormone (GH or HGH), or somatotropin, is a naturally occurring peptide hormone produced in the pituitary gland. It exists within every cell in the human body, and is responsible for cell production and growth within human cells.

Originally developed as a prescribed medicine for the treatment of children with stunted growth disorders and adults with growth hormone deficiency, the use of human growth hormone by athletes as an anabolic agent has become increasingly popular due to the extreme difficulty of detecting it in urine. While originally developed for use in the 1960s, human growth hormone was not detectable as a performance-enhancing drug until the 2004 Athens Olympics.

Athletes in power sports such as sprinting, weightlifting, powerlifting, body-building, throwing and jumping events, and contact sports are most likely to consider the use of HGH, due to its perceived benefits in lean muscle mass development, decreased body fat and accelerated recoverability. The negative side-effects of HGH use include gigantism in younger athletes, acromegaly (abnormal bone growth of the chin, forehead, elbows, hand and feet) in older athletes, thyroid issues, heart disease, high cholesterol, arthritis, diabetes, severe headaches, osteoporosis, impotence in men and menstrual problems in women.

See the article 'Dank didn't come clean with me: Earl' on the *Sydney Morning Herald*'s League HQ website (go to www.cambridge.edu.au/hscpdhpe1weblinks).

Drug use for aerobic performance

Erythropoietin (blood doping)

Erythropoietin (**EPO**) is a protein hormone produced in the kidneys, which is responsible for the production of red blood cells (erythrocytes) within the bone marrow, where it is released into the bloodstream. Medically, EPO is used to treat chronic kidney failure, anemia, HIV and cancer.

EPO a protein hormone produced in the kidneys, which is responsible for the production of red blood cells (erythrocytes) within the bone marrow, where it is released into the bloodstream

In sport, EPO is an illegal method of 'blood doping', as it is an artificial process of increasing the number of red blood cells within the human body in an attempt to improve aerobic performance. The original form of blood doping involved athletes removing some of their own blood some weeks prior to the main completion before injecting it back into the bloodstream just before competition. Known as a 'blood transfusion', the increased amount of red blood cells and the oxygen-carrying capacity to the working muscles helps to increase aerobic performance and reduce fatigue.

Figure 6.85 Use of performance-enhancing drugs creates an unfair advantage

Due to the increased risk of disease and infection associated with blood transfusions, and the lengthy process of their administration, EPO has become the blood doping drug of choice for endurance sport athletes such as cyclists, triathletes, long-distance runners and swimmers. Similar to blood transfusions, EPO increases the aerobic endurance capacity of the athlete and also helps buffer lactic acid, allowing the athlete to push harder for longer without feeling the burning effects and fatigue associated with lactic acid accumulation within the bloodstream.

After years of speculation, seven-times Tour de France winner Lance Armstrong finally admitted to taking EPO, among other drugs, during his time as a professional cyclist.

See the article 'The forgotten ones' on the Sports on Earth website (go to www.cambridge.edu.au/hscpdhpe1weblinks).

The side-effects of EPO use as a performance-enhancing agent far outweigh any benefit to the athlete. They include:

- severe headaches
- nausea
- high fevers
- fits
- anxiety
- heart attacks and strokes due to the fact that the blood becomes too thick to be pumped by the heart around the body.

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Figure 6.86 Lance Armstrong admitted to taking EPO during his time as a professional cyclist

To mask other drugs

Athletes who are prepared to cheat will to go to virtually any length in order to mask the detection of substances within the human system. **Diuretics** and alcohol are both examples of drugs that can be used to mask other drugs by rapidly removing excess urine from the body, which helps with the rapid excretion of the illegal drug from the system.

diuretic used to mask other drugs by rapidly removing excess urine from the body, which assists in the rapid excretion of the illegal drug from the system

Diuretics (masking agents)

The main medical use of diuretics is to treat conditions such as kidney disease, high blood pressure, fluid retention and swelling, cardiac failure, kidney disease and liver disease. In sport, diuretics are considered 'masking agents', and may be used for two main reasons:

- **A rapid loss in body weight.** This is achieved by eliminating excess fluid from the body as a result of the increased production of urine caused by taking diuretics. Sports that may benefit from taking a banned diuretic include those that require athletes to 'make weight' in order to compete within a set weight division, such as boxing, horse racing, wrestling, judo and weightlifting.
- **The rapid excretion of illegal performance-enhancing drugs from the system.** This is achieved by 'masking' the presence of the illegal performance-enhancing substance in the system by diluting the urine and lowering the concentration of the banned product, making it more difficult to detect.

While athletes may see a benefit in the use of diuretics for assisting in sports performance, the reality is that the negative side-effects of their use far outweigh any possible benefit to the athlete. In fact, diuretics are not a performance-enhancing substance, but cause a variety of negative side-effects that include:

- severe dehydration
- muscle cramps
- electrolyte imbalances within the body
- feeling light-headed and dizzy, and possibly fainting
- general fatigue
- fits and convulsions
- heart and kidney failure
- a rapid drop in blood pressure
- a loss of balance and coordination.

Alcohol

Despite what many people think, alcohol is not a stimulant; it is a depressant drug that acts on the central nervous system by slowing down its activity, and affecting the ability of messages to be delivered from the brain to the body. The negative effects of excessive alcohol consumption can include:

- affected concentration
- altered coordination
- inhibited reaction time
- altered speech
- poor decision-making
- dehydration
- altered vision
- nausea
- aggression
- death if consumed in large quantities.

The negative side-effects of excessive alcohol consumption from a physiological point of view

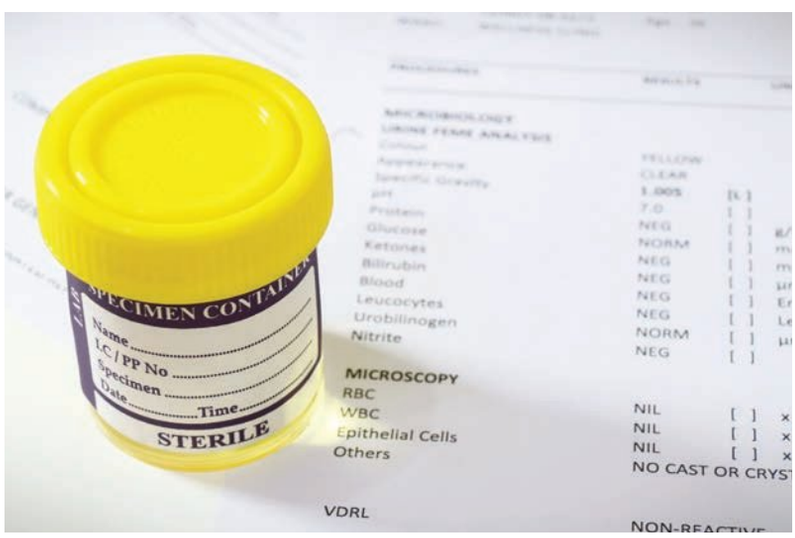

Figure 6.87 Athletes are now routinely tested for drug use under WADA (World Anti-Doping Agency) guidelines

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are clear in relation to general health and sports performance. In addition, the negative impact of excessive alcohol consumption and the poor behaviour often associated with it in relation to individuals, sporting clubs and the wider community, have been well documented by the media. The effects of poor decisions and actions associated with excessive drinking are no longer tolerated among professional sporting clubs, and there has been a significant shift away from the 'boozy' culture once synonymous with sporting clubs, due to the negative impact on sponsorship, memberships and public perception of the players and the club.

See the article 'Sterlo: Canterbury-Bankstown Bulldogs star Ben Barba opens up about traumatic period in life' on the Fox Sports website (go to www.cambridge.edu.au/hscpdhpe1weblinks).

Benefits and limitations of drug testing

Sports drug testing is critical to eliminating athletes who are prepared to cheat in order win at all costs, and to ensure that sport participation occurs in a fair and equal environment by protecting the right of doping-free sporting participation among athletes.

The government agency responsible for sample collection (often referred to as doping control or drug testing) is the Australian Sports Anti-Doping Authority (ASADA). The standard and procedures of sample collection adopted by ASADA fully comply with the standards and regulations set down in the World Anti-Doping Code.

ASADA is responsible for the sample-collection process aimed at detecting the possible use of prohibited substances – such as anabolic steroids and GHG – or methods – for example, blood doping – used by athletes. Samples collected by ASADA are sent to laboratories that have been accredited by the World Anti-Doping Agency (WADA) for analysis. The results are then returned to ASADA, which notifies the athlete and appropriate sporting organisation if a positive sample has been detected.

Testing may be conducted both in competition or outside of it, and may be performed at the competition venue, training venue or at home with no prior notice required. Testing can involve the collection of blood, urine or both. Athletes are responsible for complying with all requests for testing, and serious penalties are in place for any failure to comply with the testing regulations.

Benefits of sample collection and anti-doping

The many benefits of sample collection include:

- It is performed by an internationally recognised and accredited testing procedure to ensure adherence to strict protocols.
- It promotes and protects drug-free sports participation.
- It promotes health, fairness and equality for athletes worldwide.
- It ensures equal opportunity for all athletes, based on natural ability, drive and determination rather than artificial means.
- It acts as a deterrent to illegal doping, as testing can be conducted anywhere and at any time.
- It provides strict sanctions against athletes found to be cheating.
- It protects the rights of athletes to compete in a drug-free environment.
- It protects the athletes from the harmful side-effects attributed to illegal sports doping.

Limitations of sample collection and anti-doping

It is the responsibility of the athlete to be aware of any change to WADA's list of prohibited substances. This list is updated and revised on 1 January each year. Limitations of the process include:

- Testing is limited, due to the fact that the high-resolution mass spectrometer used to detect illegal substances in the laboratory is only capable of detecting drugs it knows how to detect. In other words, new designer drugs will not be detected, as the machine does not know they exist.
- The process of sample collection is invasive – for example, during a routine urine test, athletes must remove all clothing between the waist and

Summary 6.27

1 What are the dangers of using drugs to enhance performance?
2 Outline the drugs used to improve strength.
3 Outline the drugs used to improve aerobic performance.
4 Outline the drugs used to mask other drugs.
5 What are the benefits and limitations of drug testing?

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Checklist 6.28

1 Justify why drugs are considered unethical in sport.
2 At what level of competition should drug testing be introduced?
3 Which drugs should be tested for?
4 What are the pros and cons of drug testing?
5 What should be the consequences of drug use?

mid-thigh and roll up their sleeves in full view of the chaperone (same sex as the athlete), as athletes in the past have attempted to tamper with samples in order to avoid detection.

- The drug cheats are always one step ahead of the drug testers.
- The cost of testing is extremely expensive, amounting to millions of dollars annually throughout the world.

See the article 'BALCO owner comes clean' (go to www.cambridge.edu.au/hscpdhpe1weblinks).

Use of technology

Driving questions 6.29

1 How has technology influenced the sporting equipment that you use?
2 How much does it influence your purchasing decisions?
3 How much has it actually led to increased performance?

The information and technology age has brought with it a substantial increase in the number and variety of new and innovative technological advancements aimed at assisting both coaches and athletes to gain a greater understanding of the human body and to improve athletic performance.

Sports technology assists the coach to become more aware of the athlete's physiological responses to training – for example, the use of a portable Global Positioning System (GPS) unit worn with a vest that has a heart-rate monitor allows coaches to observe in real time the player's heart rate, total distance covered during a session or game, the ratio of high- to low-intensity running distances and the impact loads placed on the body during training and competition. Technological advances in clothing, equipment and playing surfaces have all helped athletes to improve their athletic performance. For example, road bikes are now much lighter and aerodynamic, thanks to advancements in science and technology.

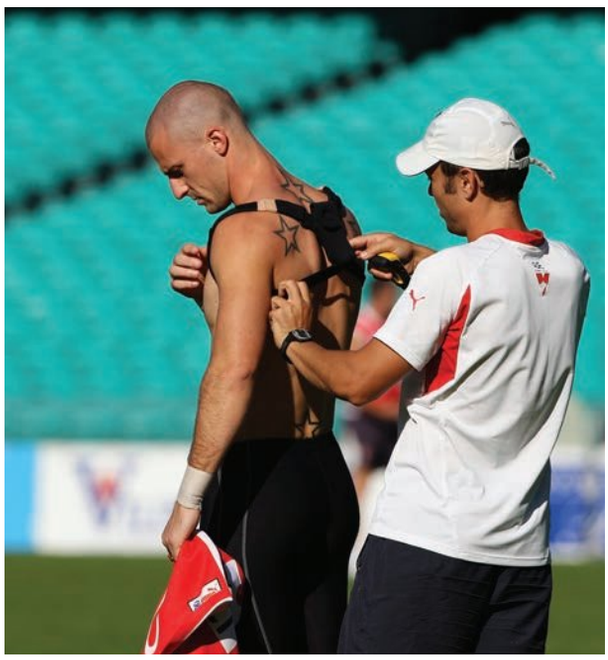

Figure 6.88 Footballer being fitted with GPS

Other examples of modern technologies used to improve sporting performance include lactate testing, biomechanical analysis and sporting equipment advancements such as fast swimsuits, golf club and ball development, tennis racquet and ball development, sports clothing and shoe advancements, and protective equipment, to name just a few.

Training innovation

In a document released by the Australian government in 2010, *Australian sport: The pathway to success*, it was stated clearly that sporting success in the future would be driven by science and technology, innovation and research.

Sporting centres such as the AIS provide an environment where coaches, athletes and sports scientists can collaborate in a working laboratory, where training innovations and methods are scientifically tested and validated using performance measures and advanced technology in order to maximise performance.

Professional sporting teams such as AFL, Rugby League, Rugby Union and soccer teams are using more advanced methods of science and technology in order to measure and monitor the physiological

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markers necessary for success in sport. The cost of staffing and equipment has significantly increased over recent years, and specialist sports science staff are now an integral part of the coaching and performance team employed to keep up to date with the latest trends and advancements in science and technology.

Examples of technology commonly used in professional team sports include:

- GPS units designed to measure distance, heart rate, high- and low-intensity sprint distance and body load
- heart rate monitors used to measure heart rate responses to training and games, particularly in endurance and team-based sports
- power-measurement technologies allowing the monitoring of power, speed and rate of force generated while strength training – a great indicator of whether the athlete is fresh or fatigued
- speed and agility gates and touch pads, which are extremely accurate indicators of running speed and reactive agility
- advanced training equipment such as compression garments, aerodynamic clothing, and improved protective and training equipment.

Lactate threshold testing

Lactate threshold testing is designed to determine the maximum steady state intensity an athlete is able to maintain without the accumulation of lactic acid in the blood. Most critical to performance for endurance-based athletes is a greater understanding of the point at which the body is unable to remove the lactic acid as quickly as it is being produced – this is the lactate threshold, and it is represented by the point at which ventilation rate increases, lactic acid levels increase rapidly, pain levels rise and fatigue rapidly sets in.

Innovations in science and technology have allowed coaches to gain a greater understanding of the athlete's maximum aerobic capacity (VO_2 max). Biomechanical analysis is designed to evaluate and improve the efficiency of movement and lactate threshold levels, and for an endurance athlete such as a runner, swimmer, cyclist or triathlete, knowledge of these factors is critical to improving aerobic performance.

While a variety of methods are available to determine the athlete's lactate threshold, the most accurate currently available is the laboratory-based lactate threshold test, which uses a bike, treadmill or rowing ergometer. Blood samples are recorded periodically during the staged progressive test, which rises in intensity until the lactate threshold is achieved. The downside of this method of testing is that it is expensive and not readily available to most athletes.

Figure 6.89 Elite endurance athletes have high lactate thresholds that can be in excess of 80–90 per cent of their VO_2 max

Many team sports are looking towards more practical, less expensive and more portable methods of assessing lactate levels during specific athletic preparation or games. A variety of portable and relatively inexpensive lactate-testing devices can be utilised during training and competition, allowing sport-specific real-time lactic acid assessment of the athlete during physical exertion.

Portable lactic acid-testing devices can also be used to test the athlete's lactic acid accumulation during sport-specific testing protocols. For example, the '300-yard' shuttle test comprising 10 shuttle runs between two cones set 27.4 metres

Figure 6.90 Administering the lactate threshold test

Figure 6.91 A stopwatch can be used as a portable lactic acid testing device

apart is a simple yet effective test designed to measure the athlete's anaerobic power lactate system for team sport athletes. On the command 'Go', the stopwatch starts and the athlete completes the 10 shuttles. The stopwatch is stopped at the completion of the tenth shuttle. After one minute of rest, the athlete's blood lactate is tested using the portable lactic acid device, and recorded for future reference. Over time, a reduction in the time taken to complete the 10 repetitions, combined with a drop in lactic acid levels, is indicative of an adaptation to lactic acid tolerance training.

Biomechanical analysis

Biomechanical analysis adopts the laws of physics and the mechanics of sports performance. By looking at the internal and external forces that affect the way the body moves as an efficient functional machine during simulated sport-specific movements, biomechanists are able to measure movement and, in collaboration with the coach, assist in the design of programs to help correct any technical flaws, minimise the risk of injury and help the athlete to move in a more efficient and energy-conserving manner in order to improve performance.

Equipment advances

Modern advances in science and technology have brought about significant advancements in sporting equipment, which have enabled athletes to improve their performance and make sport safer for all participants.

Fast swimsuits

Speedo's LZR fast suit helped athletes smash world records at the 2008 Beijing Olympics. The suit has since been banned by FINA.

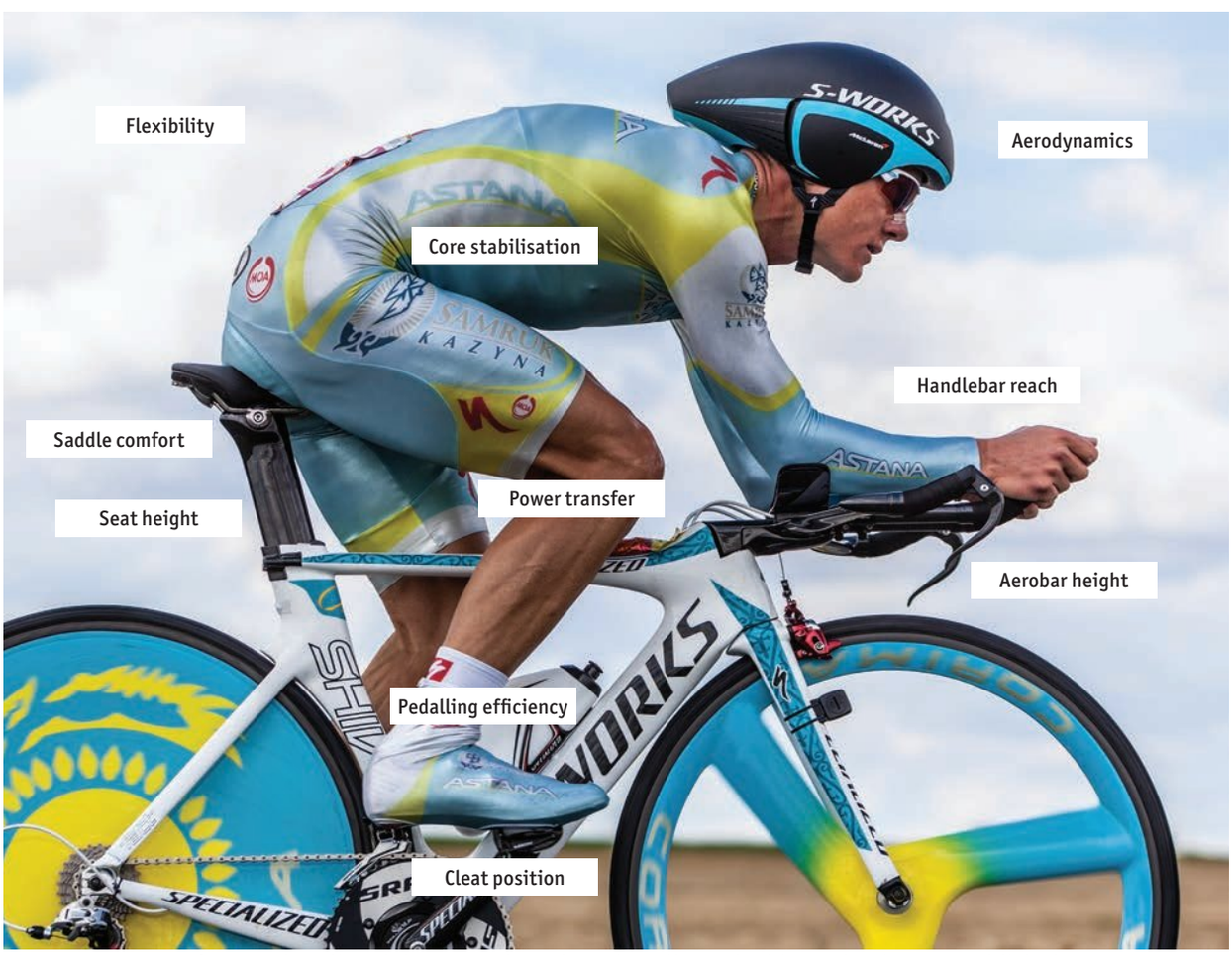

Figure 6.92 In professional cycling, laboratory-based testing allows the biomechanist to establish the most aerodynamic, movement-efficient, energy-conserving position possible

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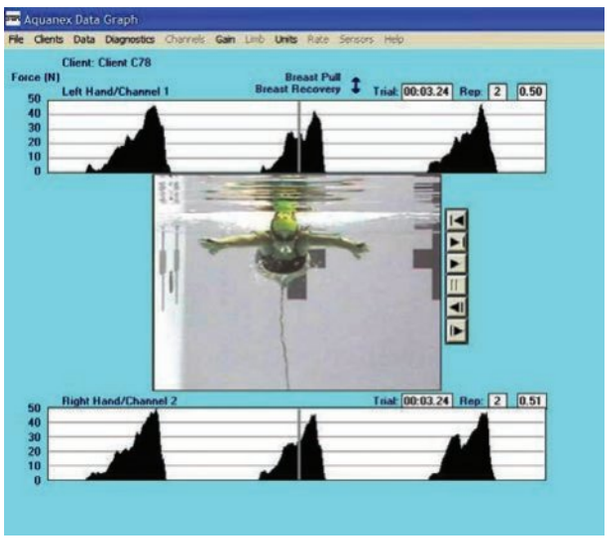

Figure 6.93 Swimmers use video analysis to assess the efficiency of the swimming stroke. Slow-motion analysis helps break the movement down to help identify technical errors.

After collaboration with an Italian company, Mectex, and the Australian Institute of Sport, and extensive testing using NASA's wind tunnel testing and fluid flow analysis equipment, Speedo launched the LZR Racer Suit in 1998.

Made using high-technology fabric comprising elastane nylon and polyurethane woven together, the suit allowed greater oxygen flow to the muscles, helped repel water, reduced drag, increased speed and assisted the athletes to maintain a more hydrodynamic position by improving buoyancy. FINA endorsed the use of the swimsuit prior to the 2008 Beijing Olympics, and consequently 23 of 25 world records were broken during the Olympics by athletes wearing the LZR suit. By 2009, 93 world records had been broken by swimmers wearing the LZR swimsuit and the suit was considered technological doping.

Figure 6.95 Speedo's LZR Racer Suit launched in 1998

FINA banned the full-length suit in 2009 and stipulated that athletes must wear half-body-length textile suits that did not aid speed, buoyancy or endurance. All world records set using the fast suit still stand today.

Figure 6.94 Biomechanical analysis of the golf swing helps to improve power and accuracy, and provides a visual picture of the golf swing that helps the athlete to gain a clear mental picture of what is required during the movement

Golf balls

In recent decades, golf technology has changed the way golf is played. Drivers are bigger and more forgiving than previous versions, irons are stronger

Summary 6.30

1. Outline a range of training innovations that have improved sporting performance.
2. Outline a range of equipment advances that have improved sporting performance.

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Examples of technological advancements in sport

Referees and umpires

- two-way radio transmission for soccer referees
- video replays in Rugby League
- third umpires in cricket
- Hawk Eye technology used during cricket matches, which allows the ball trajectory to be traced
- hot-spot technology in cricket

Figure 6.96

Cycling

- carbon-fibre bikes
- aerodynamic equipment
- protective helmets
- cleated shoes and toe clips
- heart-rate monitoring
- watts of power feedback
- distance covered
- average speed
- calories burnt

Figure 6.97

Football codes: Rugby League, Rugby Union, AFL, soccer

- GPS technology
- heart-rate monitoring
- power-output measurement
- training load monitoring
- protective equipment
- footwear advancements

Tennis

- carbon-fibre racquets
- tennis ball improvements
- Hawk Eye technology
- clothing and footwear advancements

Figure 6.98

Track and field

- synthetic tracks
- starting blocks
- electronic timing
- footwear and clothing advancements
- biomechanical analysis
- high-jump mats
- carbon-fibre pole-vault poles

Figure 6.99

Swimming

- starting blocks
- electronic timing
- swimming goggles
- waveless lane rope technology
- swimming suits
- biomechanical analysis

Cricket

- protective gloves, pads and helmets
- cricket bat and ball advancements
- cricket pitch technology
- biomechanical analysis

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Figure 6.100 Today's golf balls are multi-layered with high-technology materials

and easier to hit, and hybrid clubs are much easier to hit with, compared with fairway woods. Golf ball technology now produces golf balls that fly significantly further and straighter than their earlier counterparts.

Golf ball technology has seen advancement from balls that were filled with wood and latex to balls filled with liquid and rubber cores. Today's golf balls are multi-layered balls. The core is made of soft synthetic rubber, while outside the core are three mantle layers that progressively become harder and are made of thermoplastic polymer. The result is a ball that travels further and straighter with greater club head control.

Read more about golf ball technology on the Titleist website (go to www.cambridge.edu.au/hscpdhpe1weblinks).

Checklist 6.31

1 How has technology been used to improve performance? Provide examples.
2 Has technology gone too far?
3 Has access to technology created unfair competition?

Figure 6.101 Rowing oars made out of carbon fibre, designed to be stronger and lighter, are another example of a technological advancement in sporting equipment

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Chapter summary

- Athletes train in a variety of ways to improve performance, using strength, aerobic, anaerobic, flexibility and skills training methods.
- Forms of strength training include resistance, weight and isometric training.
- Forms of aerobic training include continuous/uniform, fartlek and long-interval training.
- Forms of anaerobic (power and speed) training include plyometrics and short-interval training.
- Forms of flexibility training include static, dynamic and ballistic training.
- Forms of skills training include drills practice, modified and small-sided games, and games for specific outcomes.
- Success in any sport requires methodical planning, organisation, evaluation and commitment. It is widely accepted that failing to plan is planning to fail.
- Planning considerations for improving performance rely on a variety of factors, including the physical and psychological performance and fitness needs of the athlete, event scheduling, and climate and seasonal factors.
- Quality planning involves setting long- , medium- and short-term goals. Pre-season, in-season and off-season phases of performance need to be considered.
- The ability of team and individual sport athletes to perform sport-specific skills efficiently and effectively is critical to achieving optimal performance.
- Ethical issues related to improving performance include the use of performance-enhancing drugs and new technologies.

Exam-style questions

1 How would an athlete train to improve performance utilising one training type?
2 How would an athlete train to improve performance utilising two training types?
3 How could training adaptations be measured and monitored?
4 Outline safe and potentially harmful training procedures for a training type.
5 Compare the specific considerations of planning for performance for elite athletes and amateur participants.
6 Outline the initial planning considerations for athletes looking to improve their performance.
7 Discuss how the planning considerations address the phases of competition.
8 How can planning for peaking and tapering improve performance?
9 Discuss each of the elements that needs to be considered when designing a training session.
10 Describe how a coach may identify an athlete suffering from over-training.
11 What should a coach consider in order to avoid over-training?
12 What is the relationship between planning and the avoidance of over-training?
13 Discuss the ethical issues associated with the use of drugs in sport.
14 What are the benefits and limitations of drug-testing?
15 How has technology been used to improve performance?
16 Has the use of technology created unfair competition in sport?
17 Discuss the ethical issues associated with the use of technology in sport.

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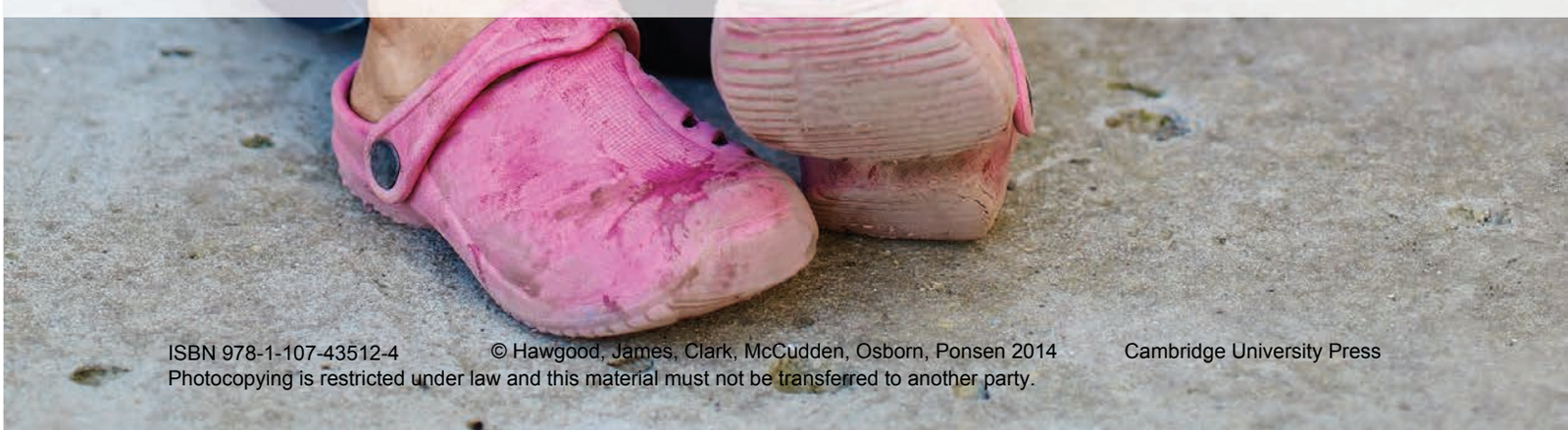
Chapter 7 Equity and Health
HSC Option 5

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

- *health inequities faced by Australians*
- *the population groups facing health inequities in Australia*
- *ways to bridge the gap in the health status of populations.*

Key terminology

advocate
empower
enable
inter-sectoral collaboration
mediate



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7.1 Health inequities faced by Australians

Driving questions 7.1

1 Why do you think there are inequities in the health of Australians?
2 Which groups in Australia suffer the greatest health inequities?

Factors that create health inequities

There are numerous factors that aid or hinder the chance of good health. Many of them are outside the control of individuals.

Daily living conditions

How people live will significantly influence their health, and as a result at least 200 million children globally are not achieving their potential. Living conditions include the necessities of life: shelter, food, sanitation and clean water. Other basic needs include peace, education and health care.

These basic necessities are far more readily available in urban and larger rural towns. There are no guarantees for these basic necessities in all rural and remote locations. Not having access to them leads to an increased risk of communicable diseases.

Daily living conditions do not simply relate to the necessities of life. The quality of the dwelling, as well as overcrowding, is a factor. Homeless people often have no dwelling, or at best a poor dwelling on occasions. This group is obviously at risk of many illnesses and disease, as well as harm or exploitation.

Where we live not only affects our health, but also plays a role in determining our future. To address poor living conditions, the following strategies need to be implemented:

- Provide more affordable housing, which must include the provision of water, sanitation and electricity.
- Promote healthy and safe behaviours, such as physical activity, healthy eating and the reduction of violence.
- Develop and introduce economic and social policies to address climate change.

Figure 7.1 Our living conditions can have a significant impact on our health into the future

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Figure 7.2 There are many health benefits associated with breastfeeding

Quality of early years of life

The early years of life are the most important developmental phase. The safe development of a child in its early years is essential for health throughout life. Growing up in a safe and loving environment builds self-esteem and provides role models. The issues that impact on the quality of the early years of life include the following:

- The pre-natal stage is the first factor that can impact on a child. The health of the mother is crucial for a good start in life. Obesity, malnutrition, mental health problems and heart disease have been associated with disadvantages in pregnancy. A low birth weight, according to research, can result in a greater chance of poor health and thus is a factor to consider. The mother's choice to breastfeed or not is an important one. There are many benefits associated with breastfeeding that a mother needs to consider.
- In the early years of life, children should be vaccinated. Immunisation provides opportunities for maintaining good health during the early years and throughout life. Currently, Australia has a very high immunisation rate.
- Access to quality education and health literacy assist with decisions about healthy behaviours and risk-avoidance. Therefore, it is paramount that parents or carers endeavour to provide a quality education for their child.
- Passive smoking is also something to which a young child can be exposed in their formative years. There are health risks associated with passive smoking. Aboriginal and Torres Strait Islander peoples and low socio-economic status (SES) groups tend to have higher rates of smoking, and therefore experience more passive smoking.
- There are two particularly significant health risks for children. Asthma affects more children than other age groups, and is more prevalent in Aboriginal and Torres Strait Islander peoples. Injuries and poisoning are the leading cause of death and morbidity for young children.

All of these issues strongly influence a child's well-being, weight, mental health, heart disease, literacy and numeracy, criminality and economic progression through life.

Going further 7.2

Inquire

Consider your early years. Do you think they have set you on track for a positive approach to health in the future?

Figure 7.3 Vaccination can maintain good health throughout life

Access to services and transport

Access to services varies across the country. Access needs to be both within reach and adequate for the population's needs. Services need to be culturally relevant, suitably located, have a minimal waiting time and allow easy access to the building itself.

Remote and rural areas have fewer GPs, dentists and specialist medical practitioners than cities. People from these areas have to travel hundreds of kilometres to access specialist treatment.

Transport arrangements can also be a factor, and not only in relation to distance. Low-SES groups and the elderly can have problems accessing the necessary transport (difficulty using public

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transport or no public transport available) to get them to the various medical services they require, thus impacting on health equity within Australia.

The proposed National Broadband Network will allow communication access to medical practitioners, but will be limited by rollout delays, cost and the fact that it is still not a face-to-face appointment.

Socio-economic factors

Those people with the highest SES have the most choices and opportunities. Those with low SES tend to be the unhealthiest. People with low SES generally have a higher death rate, suffer higher levels of morbidity and use health services more often, but access fewer preventative services such as screening facilities. Their lifestyles are often riskier, with poorer diets, a lack of exercise and higher rates of smoking and drinking excessively.

The key indicators are employment, income and education. When employment conditions are good, the individual has financial security, social status, social interactions and personal safety. This economic stability means that they can confidently make informed decisions about nutrition, exercise and housing. Type of employment can also play a role in an individual's health. Some jobs are more hazardous and risky, and thus safety plays a far more important role.

Those with lower levels of education also tend to have lower levels of health. Education provides people with options. Knowledge, skills and attributes allow people to have a good level of health literacy, and thus the ability to lead healthy lives. Without education, it is unlikely that an individual will break out of the poverty cycle.

Social attributes

Exclusion is the result of unequal power relationships. Discrimination results in unequal access to resources, capabilities and rights, which can lead to health inequities. Discrimination can limit opportunities in education, employment and other necessary services. Those who do not feel connected to any social group tend to engage in anti-social behaviour, binge drink, smoke tobacco, use illicit drugs, drive dangerously and have unsafe sexual habits.

Summary 7.3

1 What are the factors that lead to health inequities?
2 In Australia, which groups are experiencing inequities? Identify the inequities they are experiencing.

Checklist 7.4

1 Identify how these factors contribute to the inequities experienced by different population groups in Australia.
2 What would be the effect of populations being exposed to multiple risk factors?
3 What are the implications for managing existing inequities if people are exposed to multiple risk factors?

Government policies and priorities

All levels of government are responsible for setting health policies. Through the collection of taxes, governments are able to determine their priorities and enact legislation relating to various health and social issues. The government is responsible for ensuring that health inequities are reduced. Governments tend to make decisions to suit the wider population for that area or community. These decisions do not always meet the needs of everyone within that community.

Some government policies are effective, such as legislation around tobacco advertising, excise and venues. Others need time to see whether they will be effective, while others have been ineffective, like mandatory sentencing in the Northern Territory.

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7.2 The population groups facing health inequities in Australia

Aboriginal and Torres Strait Islander peoples

Aboriginal and Torres Strait Islander peoples experience significantly higher levels of disadvantage and poorer health compared with other Australians.

About 2.5 per cent of the Australian population identifies as Aboriginal or Torres Strait Islander. Approximately 60 per cent of these people are under 25, with only 3 per cent being over 65. This is due to higher fertility rates and earlier mortality. Some 25 per cent live in remote areas throughout Australia.

Areas of inequity

Overall, the statistics for Indigenous Australians indicate significantly worse health than that experienced by non-Indigenous Australians. While some areas are improving, the gap between Indigenous and non-Indigenous Australians seems to be increasing.

- **Life expectancy** is much less than for non-Indigenous Australians:
  - 72.9 years compared with 84.0 for females
  - 67.9 years compared with 79.5 for males.

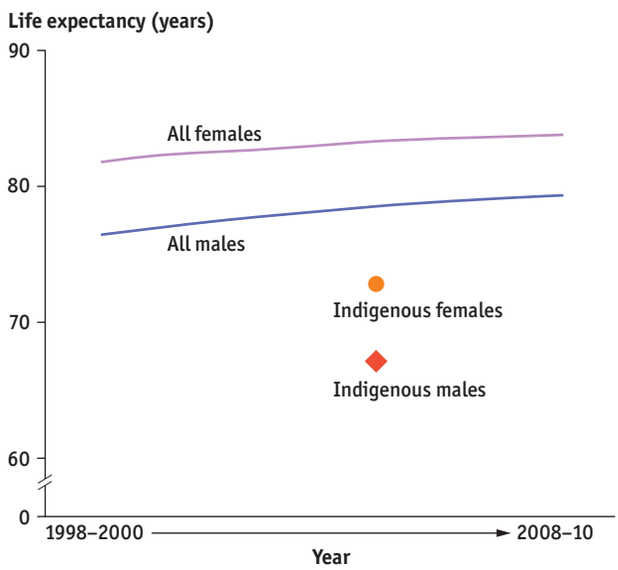

Figure 7.4 Life expectancy (including the gap between Indigenous and non-Indigenous people)

Source: ABS (2011).

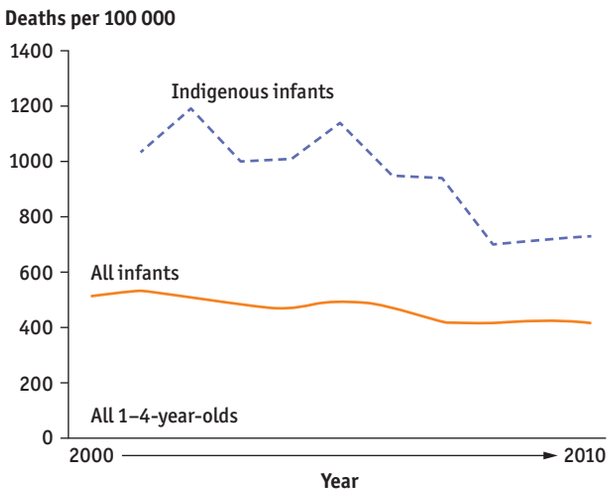

Figure 7.5 Infant/young child mortality: the number of deaths of infants (those aged under 1) divided by the number of live births, and the number of deaths of young children (those aged 1–4) divided by the population of the same age

Sources: ABS (2011); ABS (unpublished).

- The **infant mortality rate** is consistently higher for Aboriginal and Torres Strait Islander peoples, although the gap is decreasing.
- **Mortality rates** are higher for almost all causes of injury, illness and disease – they account for a higher proportion of Australia's total disease burden than the actual proportion of Indigenous Australians.
- **Cardiovascular disease (CVD)** is the leading cause of death among Aboriginal and Torres Strait Islander peoples (27 per cent). Over half the population has at least three of the risk factors associated with CVD, and the death rate is three times as high as for the general population. Tobacco smoking is a major link between Aboriginal and Torres Strait Islander peoples and CVD.
- Higher rates of new cases of **cancer** are being diagnosed, and the death rates from cancer are higher than for the general population. Indigenous people also have a lower rate of survival from cancer, but are less likely to be hospitalised due to cancer.
- Lung cancer is the most common type. Aboriginal and Torres Strait Islander people are three times more likely to get liver cancer, 2.8 more times likely to get cervical cancer, twice as likely to die from lung cancer and those

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diagnosed with breast cancer have a 100 per cent higher risk of dying than non-Indigenous females.

- **Injury** deaths are three times higher than for the general population, with hospitalisations twice as common. Accidental falls and transport-related injuries are the most common causes of unintentional injury. Intentional injuries are those due to inflictions caused by another person – the rate is 12 times that for non-Indigenous people.
- The rate of **diabetes** is three times higher than for non-Indigenous people. Aboriginal and Torres Strait Islander peoples die due to diabetes-related causes at seven times the rate of non-Aboriginal and Torres Strait Islander peoples. Pre-existing diabetes is three times more common in pregnancy and gestational diabetes is twice as common.
- **Kidney disease** is eight times higher than for non-Indigenous people, with many Indigenous people undergoing dialysis.
- **Dental health** is much poorer than for other Australians. There is more tooth decay, more untreated tooth decay and more likelihood of having teeth removed as the result of tooth decay. Indigenous people are 10 times as likely to have a moderate oral disorder.
- **Dementia** is disproportionately higher than in the general population.
- Aboriginal and Torres Strait Islander peoples are less likely to consume **alcohol**. However, those who do drink do so to harmful levels. Indigenous Australians die at seven times the rate of the general population due to mental disorders related to alcohol, and the rate of liver disease from alcohol poisoning is six times higher.

	Indigenous peoples			Other Australians			
	Number(d)	%	Number per 100 000(e)	Number	%	Number per 100 000(e)	Rate ratio(f)
Unintentional							
Transportation	1 845	10.0	333.0	10 973	2.8	246.8	1.3
Drowning and submersion	20	0.1	2.3	509	0.1	2.5	0.9
Poisoning, pharmaceuticals	345	1.9	65.7	5 804	1.5	27.8	2.4
Poisoning, other substances	113	0.6	18.2	2 620	0.7	12.6	1.4
Falls	3 772	20.5	855.9	51 205	13.1	702.6	1.2
Exposure to heat, fire, smoke and hot substances	41.3	2.2	67.8	5 405	1.4	26.4	2.6
Other unintentional(g)	4 992	27.1	901.3	28 245	7.2	617.0	1.5
Intentional							
Self-inflicted	1 460	7.9	281.6	24 225	6.2	117.3	2.4
Inflicted by another person	5 097	27.7	1 019.7	17 866	4.6	86.4	11.8
Undetermined intent	368	2.0	68.2	5 271	1.3	25.4	2.7
Total	18 425	100.0	3 686.6	392 123	100.0	1 911.3	1.9

Table 7.1 Hospitalised injury cases(a), by Indigenous status(b) and external cause groups, selected jurisdictions,(c) 2009–10

(a) Indigenous status was not stated.
(b) Includes New South Wales, Victoria, Queensland, Western Australia, South Australia and the Northern Territory (public hospitals).
(c) ICD-10-AM external causes codes aggregated as in Berry and Harrison, *Hospital separations due to injury and poisoning, Australia. 2003–04* (2007); excludes cases of medical misadventure, complications of care and sequelae of external causes.
(d) Data are directly age-standardised to the Australian population as at 30 June 2010.
(e) Indigenous rate divided by other Australians rate.
(f) Other unintentional causes includes a broad range of causes, such as exposure to inanimate mechanical forces (W20-W49), exposure to animate mechanical forces (W50-W64), other accidental threats to breathing (W75-W84), exposure to electric current, radiation and extreme ambient air temperature and pressure (W85-W99), contact with venomous animals and plants (X20-X29), exposure to forces of nature (X30-X39), over-exertion, travel and privation (X50-X57), and accidental exposure to other and unspecified factors (X58-X59).

Source: AIHW National Hospital Morbidity Database; *Australia's Health 2012*.

ISBN 978-1-107-43512-4

Individual	Socio-cultural	Socio-economic	Environmental
• Increased modifiable risk factors for preventable disease – for example, smoking, poor diet, obesity, physical inactivity, high blood pressure, high rates of unsafe drinking and substance abuse, increased risk-taking • Increased rates of disability from ill-health, resulting in chronic diseases • Increased vision (e.g. cataracts) and hearing (e.g. glue ear) impairment	• Increased fertility rates, especially for teenage mothers • Ongoing effects of colonisation and dispossession, which have led to social dislocation and a loss of land, culture and identity. Can be attributed to past government policies. • Ongoing issues surrounding discrimination, racism and harassment • Unique cultural differences, which can lead to disengagement with school and distrust of Western medical practices • Increased rates of incarceration	• Lower levels of education standards and attainment • Decreased household income and more long-term unemployment • Most employment is blue collar and labour based, which is more dangerous.	• Poor living conditions – for example, inadequate and crowded housing, unsafe drinking water and poor sanitation • Decreased access to fresh food, such as fruit and vegetables • More people live in rural and remote areas, with decreased access to health services.

Table 7.2 Impact of the health determinants on Indigenous people

- **Tobacco smoking** is common, with Indigenous people 2.2 times more likely to smoke.
- Obesity is prevalent, with 34 per cent of Aboriginal and Torres Strait Islander peoples obese compared with 18 per cent of other Australians.
- **Drug use** is higher, with a greater proportion of Indigenous peoples using cannabis than non-Indigenous people.
- There are increased rates of **hospitalisation** for most causes.

The media's role in influencing social attitudes and public policy

Despite the poor standards of health and living conditions, the media must also report on the accomplishments and positive aspects of Aboriginal community, such as sporting, cultural and educational success. This alters people's perceptions, particularly for Indigenous people themselves, and provides role models and a sense of pride. Recently, SBS has launched NITV, a channel designed for and focusing on Indigenous Australians.

Government interventions

- The Howard government's Northern Territory National Emergency Response in 2007
- The formal government apology to the stolen generations in 2008 by the Rudd government
- The Close the Gap campaign
- An increased health budget per person for Aboriginal and Torres Strait Islander peoples.

Homeless people

When a person does not have access to safe, secure and adequate housing, they can be considered homeless. This can be either short or long term. It mostly results from difficult living situations, such as abusive homes, or economic disadvantage. While many homeless people seek refuge in shelters, many more are turned away due to excess demand.

Areas of inequity

- Increased time spent homeless leads to decreased life expectancy.
- Early death mostly results from substance abuse, overdose or violence.
- Rates of homelessness have increased, especially among young people.
- There are higher rates of morbidity, particularly substance abuse, mental health (depression and schizophrenia) and communicable diseases due to poor living conditions and overcrowding.

The role of the media

The role of the media is to increase awareness of the size of the issue, and to break down stereotypes of people who are affected and present ways in which individuals, businesses and governments can support the homeless. The magazine *The Big Issue* documents stories that relate to people living in a disadvantaged way, particularly the homeless. Homeless people are encouraged to become vendors, who buy the magazine for $3 and sell it for $6, keeping the profit. However, more importantly, readers are made aware of issues affecting disadvantaged people in our society.

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Individual	Socio-cultural	Socio-economic	Environmental
• Drug use can cause or result from being homeless, leading to increased risk of mental illness. • Drug dependency often leads to increased crime to support addictions. • Homeless people feel powerless, as they must constantly rely on others for food, shelter and clothing.	• Increased rates of physical and sexual assault against homeless people. • Increased family breakdown and domestic violence can force homelessness. • Young people are able to access temporary housing and government support, which enables them to run away during difficult times at home. • Social isolation and loneliness lead to increased rates of depression. • Young people and women are at greatest risk of harm. • Indigenous people are over-represented.	• Very poor socio-economic status. • Poor education and low skills set lead to increased unemployment and inability to afford housing. • Financial distress can force people to live on the streets.	• Very harsh living conditions, especially for squatters. • Poor hygiene and sanitation. • Charitable organisations provide some support through meals, shelter and counselling.

Table 7.3 Impact of the health determinants on homeless people

Individual	Socio-cultural	Socio-economic	Environmental
• People who practise unsafe sex, especially homosexual males • People who share needles for illicit drug use • Having multiple sexual partners	• Homophobic attitudes can cause distress for those with HIV/AIDS. • A strong social stigma about the fear of contracting HIV/AIDS prevents sufferers from sharing their struggles with others. • Sex workers, and those who use their services, are particularly at risk, especially in countries in South-East Asia and Africa.	• People with low SES are more likely to have unprotected sex. • Low education leads to decreased awareness of safe sex practices.	• Facilities to protect intravenous drug users, such as sharing needles • Increased access to condoms, especially where young people go, such as nightclubs

Table 7.4 Impact of the health determinants on people living with HIV/AIDS

Government intervention

- Funding programs to prevent and support homelessness
- Supported Accommodation Assistance Program
- Assisting not-for-profit organisations who support the homeless – for example, the Salvation Army, Mission Australia.

People living with HIV/AIDS

When a person contracts human immunodeficiency virus (HIV), they suffer considerable health impacts. The virus is contracted through the transmission of bodily fluids, such as blood and semen. As a result, people who do not use condoms or share needles are most at risk of contracting it. Initially, the sufferer will experience flu-like symptoms, leading to reduced immunity, which is described as acquired immune deficiency syndrome (AIDS). Eventually, the person will die from a communicable disease, as their body is unable to fight it.

Epidemiology and areas of inequity

- Australian statistics are relatively low – Africa is facing an AIDS epidemic.
- Mortality is decreasing, as sufferers are surviving for longer, so the prevalence has increased.
- People with AIDS suffer ongoing infections, such as thrush, flu, pneumonia and cancer.
- Over 15 000 people live with HIV/AIDS – the majority are homosexual males.
- Reported cases have increased.
- Sufferers suffer mental health problems as a result of living with a debilitating and deadly disease, and possible harassment and social isolation.

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The role of the media

The role of the media is to raise awareness about the dangers and prevention of sexually transmitted infections, including HIV/AIDS. An example of this is World AIDS Day. Also, anti-harassment and vilification laws are promoted to protect the rights of those with HIV/AIDS.

Government intervention

- National HIV/AIDS strategy
- Mandatory reporting to track the virus
- Increased funding for groups most at risk, including Aboriginal and Torres Strait Islander peoples, people from an overseas background and homosexual males.

Incarcerated people

Epidemiology and areas of inequity

- Of all juvenile and adult offenders in prison, over 90 per cent are male and one in four is Indigenous.
- Incarceration rates are slowly increasing – more so for females.
- Major causes of death are suicide, drug overdose and cardiovascular disease.
- The death rate for young people in prison is considerably higher than for the rest of the population.
- Morbidity is worse, especially mental illness.
- Substance abuse is a significant problem.

The role of the media

Most media reports about people in prison focus on the negative issues of crime and violence. This reinforces stereotypes that make it difficult for released inmates to rehabilitate and successfully re-enter society. However, the media can help reverse these impressions by focusing on success stories and positive contributions made by former inmates.

Government intervention

- All prisons have medical services and personnel to provide medical care.
- Crisis care units provide counselling services.

Individual	Socio-cultural	Socio-economic	Environmental
• High rates of smoking, alcohol and drug abuse contribute to cardiovascular disease and cancer. • Poor health behaviour – for example, unsafe sex and sharing needles • Generally, incarcerated people feel a sense of isolation and powerlessness, contributing to high rates of depression and suicide.	• Social exclusion and dislocation, which is reinforced by the rejection of people when coming out of prison • While incarcerated, families break down and relationships suffer, causing a loss of connection with loved ones.	• Most offenders have very low levels of education. Programs exist in prison that increase skills and qualifications, to assist with rehabilitation. • After release from prison, offenders struggle to find employment because of their criminal record. • People with low SES may resort to illegal activities to increase disposable income levels.	• Extreme violence and disharmony exist in prison, forcing inmates to resort to extreme measures, such as drug use, to survive. • High density and living without a sense of freedom or opportunity lead to feelings of helplessness.

Table 7.5 Impact of the health determinants on incarcerated people

Individual	Socio-cultural	Socio-economic	Environmental
• Preventative health measures can reduce morbidity rates, leading to better quality of life and more independence. • Family history of cancer, cardiovascular disease and diabetes leads to increased risk. • Females generally have better health due to fewer lifestyle risk factors.	• Demographic changes indicate an ageing population. • Increased grief, social isolation and personal concerns can lead to anxiety and depression. • Elderly people often rely on friends and family to act as carers.	• Many aged people rely on the aged pension. • Increased costs of living and potentially high medical costs can lead to financial stress. • The Pharmaceutical Benefits Scheme (PBS) and Medicare Safety Net promote equity. • While unable to maintain regular employment, continued activity and volunteer work contribute on a personal and social level.	• Homes must be modified to ensure safety and independence. • Living in aged care facilities can promote social connections and help with the basic needs of living. • Transport options and mobility issues can make it difficult to access medical services.

Table 7.6 Impact of the health determinants on aged people

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Aged people

This includes Australians aged over 65 years of age, or 50 years for Indigenous people (which relates to their decreased life expectancy). The percentage of aged people in Australia is increasing, causing significant strain on budgets and health-care services.

Epidemiology and areas of inequity

- Life expectancy continues to increase gradually.
- Leading causes of mortality are cardiovascular disease, cancer, respiratory diseases, dementia and infectious diseases.
- Many aged people live with chronic disability caused by arthritis, osteoarthritis, and vision and hearing impairments.
- Aged people have higher hospitalisation rates, and tend to stay in hospital for longer.
- Many require a range of medications to treat various illnesses and diseases.

The role of the media

The media play an important role in raising the awareness in society of the issues that affect the elderly population. This encourages people to age healthily, to help elderly friends and family, and to promote positive health messages for the aged. Respect is also fostered, as some aged people suffer from some harassment and rejection by society.

Government intervention

- Home and Community Care supports aged people who live in their own homes.
- The Aged Care Assessment Team makes recommendations to help aged people access support and maintain their independence.
- There are cancer screening programs – for example, prostate and bowel cancer – to help prevent deaths from cancer-related illness.
- Special funding is available through the PBS and Medicare Safety Net to decrease health inequities.

People from culturally and linguistically diverse backgrounds

More than one in 10 Australians is from culturally and linguistically diverse backgrounds (CLDB), and may be migrants, overseas students or refugees. Since World War II, Australia has welcomed more immigrants than any other nation, resulting in a rich diversity and multiculturalism.

Epidemiology and areas of inequity

- The overall health of migrants is very high, as there are strict conditions placed upon entering Australia.

Individual	Socio-cultural	Socio-economic	Environmental
• People from Europe, Asia and Pacific Islands tend to smoke more. • Many sub-groups of people from CLDB have sedentary lifestyles and eat nutritionally poor diets – for example, North Africa, Middle East and parts of South-East Asia.	• People from CLDB may find strong social networks with people of the same origin, but are more likely to feel excluded from the rest of society. • Racism and harassment can lead to conflict, disharmony and social isolation, leading to possible mental health problems. • Anti-vilification laws, and relocation services and programs are designed to help new migrants settle. • People from non-English speaking backgrounds are more at risk of decreased access to health services. Translation services can help overcome these problems.	• Highly educated people from CLDB, such as GPs, can fill staff shortages. • Unskilled workers can also find employment in basic physical labour, but are at risk of exploitation. • Education levels are a strong determinant of health, as they contribute to a person's level of independence and self-determination. • English-speaking ability and specific health education are very important for maintaining good health. • Many health-promotion campaigns are available in other languages.	• Many unskilled migrants are located in rural areas, which can lead to further social isolation. • Often people align with others from similar backgrounds, which promotes positive connections. • Some CLDB live in overcrowded homes.

Table 7.7 Impact of the health determinants on people from culturally and linguistically diverse backgrounds

ISBN 978-1-107-43512-4

Individual	Socio-cultural	Socio-economic	Environmental
• Increased obesity and disability, which limit employment • Lack of motivation and aspiration • As unemployed people age, they become less employable.	• Household unemployment can discourage young people from completing school and setting career goals. • Culture of welfare exists in some communities, as government allowances become sufficient to live on, discouraging work.	• Unemployment directly correlates with socio-economic disadvantage, which can lead to poverty, homelessness and poor health outcomes. • Lack of education and qualifications limits work opportunities. • A changing marketplace can cause large-scale labour to be lost overseas, forcing many people to become redundant.	• Unemployment is higher in rural/remote regions. • Unemployed people are more likely to live in poor housing conditions and experience overcrowding.

Table 7.8 Impact of the health determinants on unemployed people

- The country of origin can continue to have an impact on a person's health. This often relates to socio-cultural factors such as diet and the acceptance of smoking. An example of this is the high rates of diabetes among people from Chinese, Indian and Pacific Island backgrounds. Likewise, people from the United Kingdom Netherlands and Croatia have higher rates of lung cancer.
- The longer people from CLDB live in Australia, the more the gap in health status narrows.

The role of the media

The media can promote cultural appreciation of people from diverse backgrounds, as well as raise awareness about the difficulties they face. This raises the profile of people from CLDB, highlights success stories and develops role models who can instil a sense of pride and acceptance among the Australian community.

Government intervention

- Translation services to increase access across most government departments
- Community-based support services

Unemployed people

Patterns of unemployment can be affected by economic conditions and government legislation. While some people find themselves unemployed for short periods on a regular basis, others are unable to find work for years at a time. Both short-term and long-term unemployment brings stress to the household, and health inequities increase the longer a person remains unemployed.

Epidemiology and areas of inequity

- Unemployed people tend to smoke and drink more alcohol, are less physically active, use illicit drugs and have poor diets. These risk factors contribute towards their high mortality rates for all lifestyle diseases. Another significant consequence of unemployment is the emotional toll, reflected in the high rates of mental illness.
- Increased casual and contractual work in Australia is exposing more people to these disadvantages, resulting in an increased gap in health status.
- There are higher rates of doctor visits and hospitalisation.

The role of the media

The media often focus on negative stereotypes of welfare 'cheats' and 'dole bludgers'. However, many long-term unemployed people are caught in a difficult cycle, and should be responded to with empathy. The media should provide information about opportunities to increase a person's employability as well as ways to enhance career pathways.

Government intervention

- Government-sponsored career networks exist.
- Centrelink provides welfare support as well as **enabling** people to access suitable employment or further training.
- School-based career advisers and alternative patterns of study, such as VET courses delivered by schools (e.g. Cert II Construction), are available.

enabling individuals' control over factors that affect their health

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Geographically remote populations

Epidemiology and areas of inequity

- Thirty per cent of Australians live in rural areas and 3 per cent live in remote areas of Australia.
- Health statistics are poorer than for those who live in metropolitan areas.
- Geographically remote populations experience higher death rates – for example, from CVD and motor vehicle accidents – as well as increased hospitalisation and lower life expectancy.
- Even though a small minority of Australians live in remote areas, approximately one in four of these are Indigenous.
- There are higher rates of mental health problems, cancer and diabetes.
- Morbidity rates are increasing and the mortality gap is remaining steady.

The role of the media

Rural and remote living is often presented as peaceful, healthy and productive. However, the media must ensure that this view is balanced by coverage of the difficult realities associated with living in these isolated areas. Of primary concern is the prevalence of mental health problems stemming from these health determinants. The media need to raise awareness of the warning signs for such illnesses as depression and anxiety, and to promote support networks such as the Men's Shed, conducted by beyondblue.

Government intervention

- Royal Flying Doctor Service
- Incentives for rural-based general practitioners
- National Rural and Remote Health Infrastructure Program

People with disabilities

Various types of disabilities exist, including physical, sensory speech, psychiatric, intellectual impairments and restrictions. Over 20 per cent of Australians live with some form of disability, and this is increasing as our population ages.

Epidemiology and areas of inequity

- As medical technology advances, life expectancy and quality of life increase for people living with a disability.
- As people age, they are more likely to develop a disability through injury and chronic disease.
- Congenital disabilities, present from birth, include such things as Down syndrome, cystic fibrosis and cerebral palsy.
- Young people who acquire a disability often have suffered major trauma and injury, such as spinal injury or acquired brain injury.
- As people age, disabilities arise from degeneration and disease, such as osteoarthritis, vision problems and obesity.

The role of the media

The media play an important role in highlighting the needs of people living with a disability. This

Individual	Socio-cultural	Socio-economic	Environmental
• Increased smoking and alcohol consumption • Increased levels of obesity • Decreased rates of physical activity and use of preventative health services • Many are forced to take dangerous outdoor jobs on farms.	• Increased social isolation, leading to increased risk of mental illness • Increased rates of domestic violence • The nature of work poses inherent health risks through outdoor and dangerous work on farms. • For Aboriginal and Torres Strait Islander people who live in remote areas, these risk factors are multiplied. • A stoic attitude towards health, as well as common negative health behaviours by males, leads to ill-health.	• Increased distance from cities equates to increased risk factors. • Disposable income can be variable and is often decreased during difficult times such as drought. • High rates of unemployment due to fewer work opportunities, leading to depression • Educational attainment is lower, as the challenge of distance can make it difficult for children to get to school.	• Geographic isolation means increased distance to travel, leading to decreased access to health services. • More likely to suffer from natural disasters, such as drought and floods, which can affect occupation and income, leading to increased stress. • Less availability of fresh fruit and vegetables in remote areas

Table 7.9 Impact of the health determinants on geographically remote populations

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Individual	Socio-cultural	Socio-economic	Environmental
• Risk-taking behaviour leads to increased risk of injury from accidents, especially for males. • Psychiatric disabilities generally arise from alcohol and drug abuse.	• Carers of people with disabilities sacrifice personal time and money. This is necessary, as residential care is limited. • For people with a disability who are integrated into society, supportive communities lead to positive health outcomes.	• People with a disability often rely on the Disability Support Pension. For independent adults, this can lead to financial strain. • Medical costs are often higher, despite the government concessions made available.	• Housing options are a strong determinant of health. If a person continues to live in the family home or to require full-time care in a nursing home, strong support is available. However, living in boarding houses can increase the vulnerability of people with a disability. • Access to basic medical and living services can be compromised by disability.

Table 7.10 Impact of the health determinants on people with disabilities

empathetic and caring approach encourages all people to be available to help people in their local community. The media can also act as an advocate, by speaking up for those who do not have a voice, and to lobby for increased levels of support.

Government intervention

- Disability Support Pension, Carer's Pension and other funding programs for things such as residential care
- Pharmaceutical Benefits Scheme and Medicare Safety Net
- Road safety initiative – designed to decrease the road toll
- Suitable job opportunities made available for people with limited capacities.

Checklist 7.5

1 What generalisations have been made about population groups experiencing health inequities? Are these true?
2 Analyse the inequities of a population group by examining:
   - health data to determine areas of inequity
   - the impact of the health determinants
   - the media's role in influencing social attitudes and public policy
   - government interventions.

Figure 7.6 Various government interventions can assist people living with disabilities to achieve equity

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7.3 Ways to bridge the gap in the health status of populations

Driving question 7.6

How would you go about bridging the gap in the health status of population groups?

Funding to improve health

All levels of government fund and administer Australia's health-care system, along with private health insurance and services. Public health, which is funded through Medicare, is funded by the federal government and has three components: medical services (e.g. GPs and specialists), prescription pharmaceuticals (e.g. Pharmaceutical Benefits Scheme) and public hospitals. Other primary areas of the health-care system include health promotion, community-based services (e.g. maternal services for babies), specific services for Indigenous people, mental health services and health-based research. State governments have the main responsibility of delivering primary health-care services, and receive the funding to do so from the federal government.

Funding for health

According to the Australian Institute of Health and Welfare (AIHW), in 2009–10, total expenditure on health totalled $121.4 billion, which equated to $6787 per Indigenous Australian and $4876 per non-Indigenous Australian. This is primarily sourced through general taxation as well as the Medicare levy. All levels of government are then responsible for directing this funding in the most effective direction, with the primary aims of addressing the health-care needs of individuals, reducing health inequities that exist for specific population groups and delivering health-promotion programs aimed at improving people's quality of health, both now and into the future. Other government departments such as the Department of Health and other specific health projects are then responsible for using this money to meet their mandates and intended goals. The primary aims of health promotion are to decrease health inequities and increase access to health services.

Medicare is Australia's public health insurance scheme, which provides free and subsidised health-care services. Examples of this include doctors who bulk bill, and the free services provided by public hospitals, such as emergency care and surgery. The Medicare Safety Net and PBS exist to ensure that no Australian should carry a significant burden to meet their immediate health-care needs, especially those with little disposable income.

Private health insurance is partly supported and encouraged by the government (e.g. 30 per cent rebate on premiums), which eases the burden on the public health-care system.

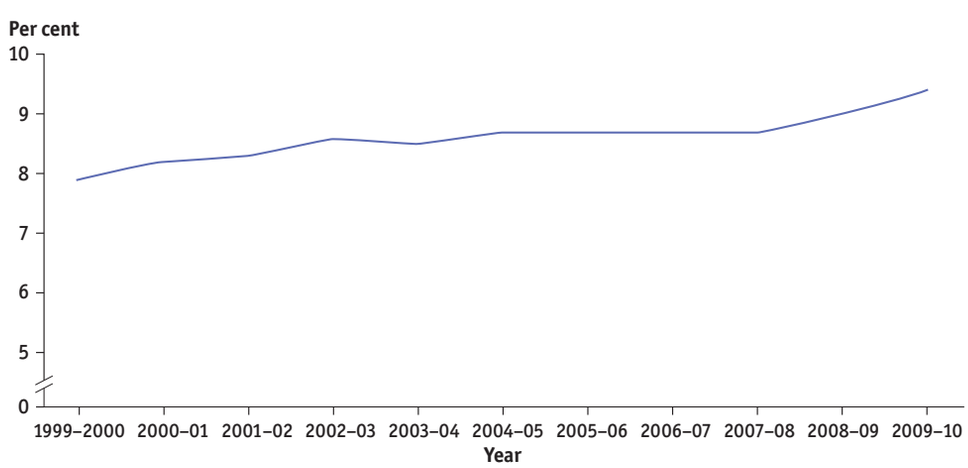

Figure 7.7 Annual health-to-GDP spending ratio, 1999–2000 to 2009–10

Sources: AIHW (2011); ABS (2011).

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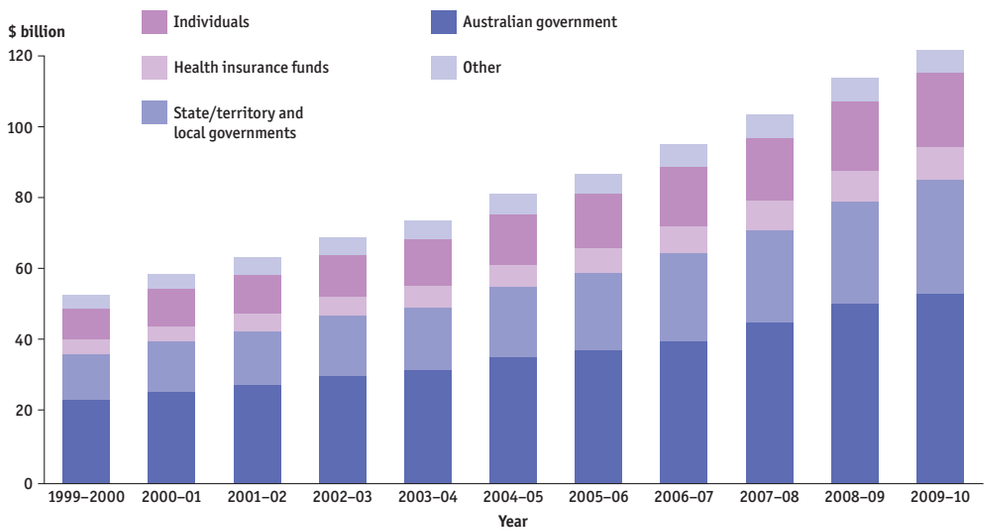

Figure 7.8 Total funding for the health industry, by source, 1999–2000 to 2009–10[(a)]

(a) Funding of spending by individuals includes non-specific tax expenditure (that is, the medical expenses rebate, which funds 20 cents of every dollar spent on health-related goods and services, once spending exceeds $2000 in a tax year).

Funding for specific populations

While the health of most Australians is excellent in global terms, many specific population groups have a worse health status than the general population. This is largely caused by external health determinants such as socio-cultural, socio-economic and environmental forces, mostly outside the control of the individual. Therefore, to achieve social justice and health equity, increased attention and money are directed towards these groups. This is reflected in the increased amount of money that is spent per person in a specific group – such as for Indigenous Australians, who receive approximately 15 per cent more than non-Indigenous Australians. This funding generally supports culturally sensitive primary health-care and health-promotion programs, such as the Close the Gap campaign. This specific funding is designed to meet the increased needs of the immediate population, and to reduce the gap in health inequity for future generations.

Summary 7.7

Outline where the health funding goes in Australia.

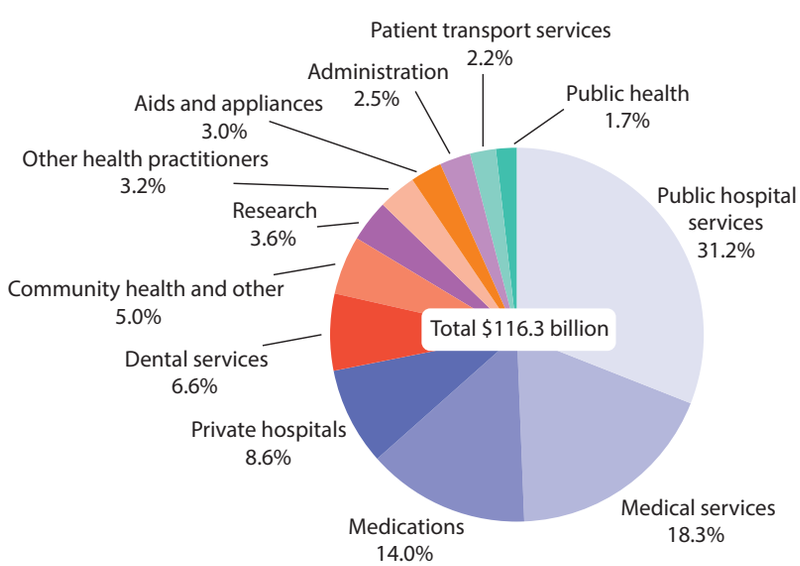

Figure 7.9 Recurrent spending on health goods and services, 2009–10

Source: AIHW (2011).

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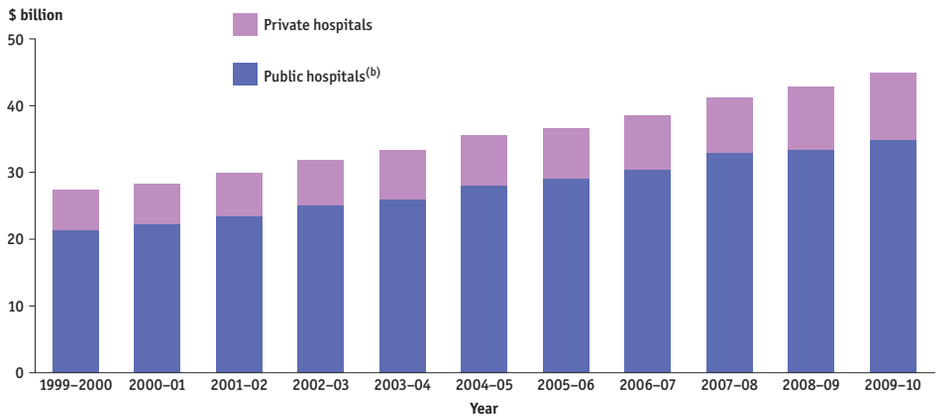

Figure 7.10 Recurrent spending on public and private hospitals, 1999–2000 to 2009–10, constant prices(a)

(a) Constant price health spending for 1999–2000 to 2009–10 is expressed in terms of 2009–10 prices.
(b) Includes dental services, community health services, patient-transport services, public health and health research undertaken by the hospital.

Source: AIHW (2011).

Limited resources

Despite the vast amounts of money that are already spent on health, government budgets are very tight, as they seek to meet the increased demands that come with an ageing and growing population, as well as more expensive treatments and services. Therefore, it is essential that all money spent on health be used wisely, to achieve the greatest health outcomes for all Australians. The challenge for policy-makers is to decide where more money needs to be spent to achieve health equity across the population, as well as seeking to improve the health of future generations. Sometimes, this means money needs to be directed away from curative services to more preventative health measures, which is sometimes seen as irresponsible. To ease the burden on the health-care system, both now and into the future, the government has established such policies as compulsory superannuation for self-funded retirees, incentives for private health insurance and 'healthy ageing' promotion programs.

Checklist 7.8

1. Does health funding solve inequities?
2. Will improving the health of all Australians reduce the gap?
3. Where should funding go – to the greatest need or the greatest chance of success? Can it do both?

Actions that improve health

Funding is an essential component of improving the health standards of all Australians, but other actions that seek to address areas of concern where social injustice occurs are required.

Enabling

Enabling uses the skills and knowledge of individuals and communities to cause change. Effective health promotion seeks to reduce the gaps in health status and to ensure equal access to opportunities and resources for all Australians. By providing stability, education, a supportive social and physical environment and access to health information and skills, all Australians are enabled to achieve the best health possible. This empowerment requires the development of specific health literacy and knowledge, skills and the development of positive attitudes that reinforce good health behaviours, which ultimately increase the control people have over their own health.

Mediating

There are many stakeholders who are interested in the health and well-being of Australian communities. These can involve government departments, non-government organisations, businesses, community groups and individuals. This is deemed an inter-sectoral approach. Coordinated action and collaboration between these sectors result in a stronger and more effective response to the health-care needs of specific population groups, and also ensure that the accurate and specific needs of a group are prioritised. Where a conflict of interest or opinion occurs, the role of **mediation** between groups is even more important in order to make the right decision that promotes and protects health.

mediation working to bring about agreement

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Advocating

The value of social justice focuses on the needs and concerns of the most vulnerable and disadvantaged communities. **Advocacy** groups stand up to government bodies and other groups for a cause in which they believe passionately. Social, medical and community representatives who work with these groups are in the best position to raise awareness and lobby policy-makers to respond to the needs of these groups. This is particularly important for communities that have poor access to health information, services and products, such as refugees, Indigenous Australians and people living with disabilities who may be unable to stand up for themselves.

advocacy an action aimed at gaining support for a particular cause

Checklist 7.9

Explain the nature of enabling, mediation and advocacy when working to improve a range of disadvantaged groups.

A social justice framework for addressing health inequities

The principles of social justice are equity, access, participation and rights. These must underpin all health-promotion initiatives aimed at reducing health inequities. Frameworks, which could be described as blueprints or plans, give structure and focus, and help policy-makers to effectively address health issues. A social justice framework seeks to address the broader societal issues and determinants that cause health inequities, rather than focusing all attention on the individual.

Empowering individuals in disadvantaged circumstances

By increasing a person's health-related knowledge and skills, as well as improving their access to health information, individuals are more able to control their health behaviours. Health literacy increases decision-making ability, and if a person has a positive attitude towards their own health and well-being, they are enabled to take more control. Positive role models and support networks encourage change, and education must be culturally specific to the specific population.

Empowering disadvantaged communities

Strong socio-cultural forces include the influence of peers, families, subculture, religion and the media. Often people are not aware of these powerful factors, and the influencing effect can be almost unknown. For example, binge drinking among young males seems almost inevitable, as Australian culture reinforces this behaviour as expected and acceptable. To improve health attitudes and behaviours, whole communities and social groups must be united. To **empower** disadvantaged communities, they must be included in relevant discussions and decision-making processes. These can include community forums or action groups, fundraising for improved facilities and culturally specific awareness-raising campaigns.

empower to equip with an ability

Improving access to facilities and services

Access to essential services is fundamental to reducing health inequities in Australia. Financial status, education, geographic location, transport availability and language barriers are some of the factors that affect one's access to health facilities and services. By overcoming these, especially for disadvantaged groups, health inequities are reduced. For example, primary medical services in appropriate locations, interpreter services, mobile GPs, improved broadband services and economic support to disadvantaged groups are all policies designed to improve access to health.

Encouraging economic and cultural change

To positively shift the strong determinants for health, economic policy must be reviewed and based on valid research, and cultural forces need to be identified and appropriately managed. These decisions often result in much conflict between relevant stakeholders. For example, if the health budget is to have an increased focus on one area over another, without collecting more tax, the money will need to be withdrawn from elsewhere. For this reason, health budgets must be set with an agenda that seeks to meet the greatest demand, to reduce health inequities and social injustices and to seek to improve health outcomes for future generations.

Reducing the inequity between individuals requires reducing the income gap within Australia. This can be achieved through taxation measures and award wages.

An attitude of 'personal responsibility for health' is counter-productive in this process. Therefore,

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Australians must have an attitude of empathy and care for minority groups who are disadvantaged, as they will receive greater allocations of funding. To address health-compromising attitudes and behaviours among a specific group, such as dangerous driving among young males, health-promotion campaigns must seek to change the cultural forces that reinforce this message. This is a challenging process, and requires a multi-faceted approach. For this issue, the combined efforts of the police, the Road Transport Authority and schools are required.

Summary 7.10

Outline the social justice framework.

Checklist 7.11

Use the social justice framework to develop a plan that addresses the causal factors of inequity.

Characteristics of effective health-promotion strategies

The Ottawa Charter is acknowledged as an effective framework for health promotion. Initiatives that address each action area combine to present a powerful message that seeks to increase health outcomes. To be successful and effective in the long term, health-promotion strategies need to address the following.

- **Working with the target group in program design and implementation:** During initial consultation and planning, the target group must be involved, along with other relevant sectors. By strengthening community action and involvement, groups are given an opportunity to voice their needs and concerns, and a sense of ownership is developed among the community as it is involved in the decision-making process. Ultimately, this increases the likelihood of success.
- **Ensuring cultural relevance and appropriateness:** Sub-groups in our population vary greatly in their values, attitudes and cultural differences. Health-promotion strategies must be sensitive to these, ensuring they are relevant and appropriate. For example, an awareness-raising campaign about the dangers of tanning among young people should use slogans and images that target this particular group. This is also particularly important when working with Indigenous groups, as their unique cultural traditions and beliefs must be respected.
- **Focusing on skills, education and prevention:** Empowerment of the individual lies at the heart of changing health behaviours and attitudes of society. However, it is widely recognised that this alone is an ineffective measure to address health inequities. The development of health literacy and personal skills through education empowers individuals to make decisions that will benefit their health, and prevent the likelihood of developing lifestyle diseases. Basic examples of this include education about the risk factors for disease, nutritional information, skills in using health services, safe driving attitudes and recommended exercise levels.
- **Supporting the whole population while directing extra resources to those in high risk groups:** When targeting minority groups who suffer health inequities, it is essential that the general population maintains its health status, and even improves it. Generally, by addressing health inequities, overall health status does improve, but the needs and concerns of all Australians must be kept in mind. This is evident in most primary health-promotion strategies, which are aimed at all Australians, and are then also adapted to suit a particular group. For example, the Heart Foundation seeks to improve the heart health of all Australians, as well as targeting Aboriginal and Torres Strait Islander communities.
- **Inter-sectoral collaboration:** Large-scale health-promotion campaigns rely on the involvement, support, funding and opinions of a variety of stakeholders. These can include government departments, non-government organisations, community groups, businesses and individuals. Coordinated collaboration between these sectors ensures that resources

inter-sectoral working with one or more sectors of society

Summary 7.12

Outline the characteristics of an effective health-promotion strategy. Provide examples.

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are multiplied and used effectively, there is no crossover or duplication of effort and a greater range of professional opinions can be used in the design and implementation of a health-promotion strategy.

Checklist 7.13

1 What characteristics contribute to the sustainability of health-promotion strategies?
2 Analyse a specific health-promotion strategy and predict its potential for success.

Figure 7.11 Breaking down language barriers can help to reduce health inequities for culturally and linguistically diverse population groups in Australia

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Chapter summary

- There are many factors that increase the likelihood that a person will experience health inequality in Australia.
- Factors that increase the likelihood of health inequality include the quality of living conditions; quality of life during early childhood; access to public services, including affordable health services, information (e.g. public libraries, the internet) and public transport; socio-economic status; frequent discrimination; and inadequate government policies and priorities.
- Some groups of Australians are more likely to experience health inequalities than others. They include Aboriginal and Torres Strait Islander peoples, the homeless, people with HIV/AIDS, the incarcerated, the elderly, people with culturally and linguistically diverse backgrounds, the unemployed, people in geographically remote places and people with disabilities.
- These groups are significantly more likely to experience health issues related to smoking, alcohol and substance abuse, mental illness, obesity and lack of treatment of existing medical conditions, among other factors.
- The principles of social justice – equity, access, participation and rights – must underpin all health-promotion initiatives aimed at reducing health inequities.
- A successful social justice framework will be one that empowers individuals in disadvantaged circumstances, empowers disadvantaged communities, improves access to facilities and services, and encourages economic and cultural change.
- Effective health-promotion strategies look to work with the target group in program design and implementation; ensure cultural relevance and appropriateness; focus on skills, education and prevention; and undertake inter-sectoral collaboration.

Exam-style questions

1 Identify how various factors contribute to the inequities experienced by different groups in Australia.
2 How does the exposure to multiple risk factors contribute to health inequities?
3 Discuss the health inequities experienced by a population group.
4 How can funding improve health?
5 Does funding solve health inequities?
6 Should funding go where there is the greatest area of need? Discuss.
7 Explain the actions that improve health.
8 How does the social justice framework address the causal factors of inequity?
9 What characteristics of effective health promotion contribute to the sustainability of health strategies?
10 Analyse the characteristics of a specific health-promotion strategy and predict its potential for success.

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Glossary

abrasion superficial skin damage

acclimatisation preparing the body for a particular climatic condition

acute sudden injury

adaptation the human body's physiological response to training. By applying a greater load, the body will adapt in order to cope with the increased load.

adenosine triphosphate (ATP) high-energy compound that is the basic source of energy for the functions of cells, such as a muscular contraction

advocacy an action aimed at gaining support for a particular cause

aerobic capacity the capacity to maintain work in the aerobic energy system

aerobic pathways chemical pathways that function in the presence of oxygen

aerobic power the capacity to do the most work in the aerobic energy system

agonist the muscle responsible for causing a specific movement

amateur someone who participates in sport without being paid

anabolic steroids the illegal performance-enhancing drugs most closely linked with the development of explosive strength, speed and power

anaerobic pathways chemical pathways that function in the absence of oxygen

ancillary cover private health insurance cover for extras such as physiotherapy, dental and optical services

antagonist a muscle that works in opposition to the movement generated by the agonist

asylum seeker the name given to a person who is seeking protection as a refugee and is still waiting to have a claim assessed

atherosclerosis a condition where plaque forms on the inside of arteries

atrophy decrease in muscle size due to a lack of training stimulus

autonomy independence and freedom to be able to make one's own decisions

benign a tumour that is not considered harmful

bulk-billing the patient does not pay for the medical service; instead, the medical practitioner directly bills Medicare

cardiac output the volume of blood ejected by the left ventricle of the heart per minute, generally measured in millilitres per minute

chronic prolonged injury

commodification the process by which something that is of no commercial value is turned into something that can be bought or sold

commodity something of value that can be bought or sold

competition act of contesting a game, race or challenge

concentration focusing one's mental attention on a particular thought process, while ignoring other irrelevant thoughts or events being perceived

conduction transfer of heat to and from the skin via direct contact with an object

connectedness the number and quality of social connections or relationships with family, friends and acquaintances

continuous training an extended, predominately steady-state training session that lasts no less than 15 to 20 minutes

contusion damage to the muscle, resulting in internal bleeding/bruising

convection air moving across the skin's surface

cultural identity a person's affiliation with a particular cultural group

determinants factors that determine the health of an individual

direct sustained through external force

dislocation disruption of the alignment of bones within a joint

diuretic used to mask other drugs by rapidly removing excess urine from the body, which assists in the rapid excretion of the illegal drug from the system

empower to equip with an ability

enabling an individual's control over factors that affect their health

environmental relating to a person's surroundings

epidemiology the branch of medicine that studies the causes, distribution and determinants of disease in a population

EPO a protein hormone produced in the kidneys, which is responsible for the production of red blood cells (erythrocytes) within the bone marrow, where it is released into the bloodstream

evaporation loss of heat via sweating

extrinsic motivation any motivational factor that is derived from an external source

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fartlek training involving varying the pace or speed of your run, alternating between fast segments and slow jogs

fast-twitch muscle fibres a muscle fibre type better suited to short bursts of explosive activity that require maximal force production; also known as type II muscle fibre

fracture disruption to the continuity of the outer surface of a bone

glycogen the stored form of glucose, found in the muscles and the liver

glycolysis the breakdown of glucose for fuel

goal-setting the process of establishing achievable and realistic goals, to increase motivation and provide direction to an athlete's behaviour

haemoglobin an iron-containing protein pigment of red-blood cells that carries oxygen from the lungs to the working cells of the body to assist in aerobic respiration

hard tissue bones and teeth

health literacy the ability to access, read and interpret health-based information, and to then make an informed and relevant decision that supports and promotes good personal health

health status the general pattern of health in a population over a period of time

healthy ageing behaviours that reduce the risk of illness and disease in older people

hypertension high blood pressure

imagery the internal and visual creation or recollection of images and scenarios

incidence the number of new cases of a disease in a population over a period of time

indirect sustained through internal force

inequality difference in outcomes

inequity lack of fairness

infant mortality the number of deaths in the first year of life per 1000 live births

inflammatory response natural response immediately following tissue damage

inter-sectoral working with one or more sectors of society

intrinsic motivation a motivational factor that is derived from within the athlete's own thought patterns

isometric training movements where neither the joint angle nor muscle length changes during the muscular contraction

kilojoule (kJ) a measurement of energy (sometimes called a calorie, which is equal to 4.2 kJ)

laceration irregular cut into tissue

lactate a substance that is formed when pyruvate picks up hydrogen atoms, to help decrease muscle acidity; metabolised in the liver

lactate threshold (also known as the anaerobic threshold) the level at which the exercise intensity rises to a point where lactate (lactic acid) starts to accumulate in the bloodstream. It is at this point that the exercise is no longer fuelled aerobically, but anaerobically.

legislation laws and rules set by a government or governing authority

lethargy persistent fatigue

life expectancy a measure of how long, on average, a person is expected to live

lung capacity the volume of air capable of being drawn into the lungs as an athlete inhales

lysis the breakdown or decomposition of a cell or substance

macro-cycle the long-term annual plan for the entire season

malignant a tumour that has spread, or has the ability to spread, throughout the body

manliness the qualities ascribed to men, such as strength or bravery

mechanical energy energy involving movement or motion

mediation working to bring about agreement

Medicare government health service that provides equitable health care

Medicare levy tax collected to fund Medicare

Medicare levy surcharge extra tax taken from higher income earners

Medicare safety net a threshold that caps medical expenses annually

metastasis a secondary malignant growth

micro-cycle the smallest block of training, typically comprising a week of training

morbidity the incidence of illness, injury and diseases that do not result in death in a specific population

mortality the number of deaths from a specific cause or in a specific population over a period of time (usually one year)

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muscle fibres the functional components of muscles, with a unique ability to shorten and contract, leading to body movement

muscle hypertrophy increase in size and growth of muscle cells, leading to an increase in overall muscle size, strength and power

muscular Christianity nineteenth-century concept of a healthy body combined with fine morals of sportsmanship and leading an actively Christian life

negative motivation any motivational factor that is perceived as undesirable and as something to be avoided

over-training the physical, psychological and emotional state that occurs when the training comprises loads and intensities that exceed the recovery capacity of the athlete, resulting in a decline in fitness and performance

over-use sustained due to repetitive tasks

oxygen uptake the amount of oxygen being taken into the working muscles per minute

patriotism national loyalty, love and support for and defence of one's country

peaking achieved when the athlete has reached a state of optimal physical, psychological, emotional and spiritual health and well-being

periodisation the manipulating of training loads over time in order to bring about optimal gains in performance

Pharmaceutical Benefits Scheme (PBS) a government scheme that subsidises the cost of certain medicines

physical activity any movement by the body that requires expenditure of the skeletal muscles

plyometrics jumps training or 'plyos'; an example of ballistic training

positive motivation any motivational factor that is perceived as desirable and as something worthy of personal investment to achieve

prevalence the total number of cases of a disease in a given population at a specific point in time

professional players who receive payments for playing a sport, or make it their livelihood

public policy guidelines, plans and proposed courses of action, that will influence decisions, actions and other matters that affect the wider community

pyruvate the substance resulting from glycolysis

radiation transfer of heat to and from the atmosphere

relaxation the use of specific techniques to help calm an over-emotive athlete, suffering from high levels of stress, anxiety or arousal

repetition maximum the number of repetitions you can perform with a given weight before muscular failure

resilience the ability to 'bounce back', recover and respond positively to challenging, stressful and traumatic situations

resting heart rate the number of times a person's heart beats per minute while at complete rest

resynthesis to recombine broken and separated components back together in their original form

RICER method for treating soft-tissue injuries

self-concept the belief a person has in their own strengths, abilities, personality and status; a sense of the kind of person you are

self-esteem the level of respect and satisfaction people feel about themselves

self-identity recognition, awareness and acceptance of the qualities and characteristics that make an individual feel unique

self-sufficiency ability to survive and provide for your own needs without the help of others

self-worth a person's inner belief in their own value and place in the world, and that they are worthy of esteem and respect from others

sexism attitudes that stereotype people according to their gender, rather than judging them on individual worth

sexploitation forms of marketing, promotion or attempts to gain media coverage that focus attention on the sexual attributes of female athletes

slow-twitch muscle fibres a type of muscle fibre better suited to endurance activities that require a low force production over a longer duration; also known as type I muscle fibre

social justice justice based on human rights – equity, diversity and supportive environments

soft tissue muscles, tendons, ligaments and skin

sport an activity involving physical exertion and skill that is governed by a set of rules or customs and is often undertaken competitively

sprain tear that occurs in the ligaments

state anxiety feelings of anxiety related to a specific game or event

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strain tear that occurs in the muscles or tendons

stress a psychological and physiological reaction to a perceived threat

stroke volume the volume of blood ejected by the left ventricle of the heart during each systemic contraction, measured in millilitres per beat

subluxation a dislocation that immediately realigns

tapering a period of reduced training load in the days and weeks leading up to the main competition in an attempt to promote 'peak' performance at the most vital time

thermoregulation ability of the body to maintain its temperature within normal limits

TOTAPS method for assessing injuries

trait anxiety the genetic predisposition and proclivity an athlete has towards increased anxiousness and nervousness

visualisation creating and focusing on a range of positive mental images and experiences, to achieve specific psychological benefits

VO_2 max the maximum amount of oxygen a person's body can absorb during exercise, measured in millilitres of oxygen per kilogram per minute absorbed into the muscles

Multiple-choice answers

Chapter 1

1 B 2 D 3 C 4 D 5 B 6 B 7 A 8 B 9 C 10 C

Chapter 2

1 C 2 D 3 A 4 C 5 A 6 D 7 A 8 D 9 C 10 B

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Index

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