Chapter 5: Physical activity, fitness and health

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Chapter 5: Physical activity, fitness and health

Introduction

Being fit and healthy has many benefits, including less sickness, more energy and a happier state of mind. Good health means an improved quality of life across all areas of health, including physical fitness. There are many ways to assess our levels of physical activity to determine if we meet the national guidelines. Overcoming barriers to physical activity can be challenging, but with knowledge and support, we can develop simple training programs to enhance all areas of health and fitness.

According to the National Physical Activity Guidelines, we should ‘think of movement as an opportunity, not an inconvenience’.

ESSENTIAL QUESTION

Why is it important for all individuals to be involved in regular physical activity, and how can this contribute to health and wellbeing at different stages of their lives?
STARTER QUESTIONS

1. What type of physical activities do you do every week?
2. How many hours of television do you watch every week?
3. Do you know how to test your own and others’ fitness levels?
4. What type of training activities could you do within the school grounds?

INQUIRY SEQUENCE

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Review

5.1 Health and fitness

Health and fitness are the most valuable assets an individual can possess, and they have a large influence over the quality of one’s life.

ENGAGE

Although advances in medical science have reduced the impact of illness and disease on our society, our modern way of life has created many new health problems and challenges. Mechanisation and technology have reduced manual labour, leading to an increasingly sedentary workforce. Lifestyle factors such as convenience and fast foods, increased drug use and environmental health hazards are responsible for a range of health problems that are costly to both the individual and the broader community.
In small groups, brainstorm words associated with physical health, mental health, social health, spiritual health, health-related fitness and performance-related fitness. Use the Creating word art weblink in your Resources section to create a word cloud that defines the terms 'health' and 'fitness'. Share your group's definitions and word cloud with the class.

Eating healthy foods, developing a positive self image, showing self-respect and maintaining a healthy body are some of the aspects of health and fitness.

EXPLORE

What is health and fitness?

Health is multifaceted. It is much more than just a physical state. For an individual, good health implies a quality of life, and must be viewed in terms of its physical, mental (emotional), social and spiritual aspects. Health is also dynamic in nature. It is constantly changing and varies from one person to another.
What is fitness?

The Australian Better Health Commission (BHC) defines health from both an individual and community perspective:

To the individual, good health means improved quality of life, less sickness and disability, a happier personal, family and social existence, and the opportunity to make choices in work and recreation. To the community, good health means a higher standard of living, greater participation in making and implementing community health policies, and reducing health care costs.

Physical health

Physical health is perhaps the area of health with which you are most familiar. It generally refers to the physiological functioning of the body, and is most closely linked to fitness. To ensure the efficient functioning of your body, you need to:

- eat regularly and follow a diet based on sound dietary guidelines
- maintain your recommended weight given your age, sex and height
- regularly participate in exercise and physical activity, and maintain a sufficient level of fitness
- manage your stress levels through exercise, recreation and rest
- practise good dental and body hygiene.
Mental health

Mental health or emotional health refers to the functioning of a person’s mind, and includes such things as the expression of emotions and feelings, and the ability to cope with the pressures and stress of daily living. It also refers to the ability to make reasonable decisions and resolve problems. Your self-esteem is also closely related to your state of mental health.

Mental health is based on a number of related processes, including:

• developing a positive self-image
• developing effective communication and decision-making skills
• accepting responsibility for your own actions and behaviour
• recognising and accepting differences in opinions and values
• expressing and receiving feelings of love and friendship
• optimism and positive self-talk.

Social health

Social health refers to the ability to develop and maintain positive relationships with others, including family, friends, peers and colleagues. Your level of social health can be optimised by:

• developing the personal skills of effective communication, decision making and conflict resolution
• developing relationships with a variety of people
• behaving in a socially acceptable manner
• demonstrating respect and empathy for others.
Friendship is important for wellbeing.

Spiritual health

Spiritual health encompasses our ideals, values, morals and ambitions. It links our physical, mental and social health.

In fact, all of the different areas of health are interrelated. For example, sufficient exercise, recreation and rest are not only factors in maintaining physical health but they are also important factors in ensuring mental health. Use the Healthy living interactivity in your Resources section to identify actions you can take to improve all aspects of your health.

What is fitness?

Physical fitness may be defined as your ability to complete all that you need and desire to in a day without becoming exhausted. It also means having enough energy left to be able to deal with emergencies. Having adequate rest and relaxation is also related to a good physical fitness level. Adequate physical activity and good nutrition lead to increased physical, mental and social health.

There are two different types of physical fitness to which individuals may aspire.

Health-related fitness

Health-related fitness focuses on essential body functions that have a direct impact on your health. Developing a sufficient level of physical fitness will improve the way you look, feel and behave, enhancing your quality of life and chances of living longer. The National Physical Activity Guidelines, discussed in section 5.2, provide specific guidelines about activity levels for achieving health-related fitness. This aspect of fitness has a number of components, including:

- cardiorespiratory fitness (or aerobic power)
• muscular strength
• local muscular endurance (LME)
• flexibility
• body composition.

Skill-related fitness

Skill-related fitness relates to those additional aspects that promote skilled performance. This is particularly important for people who are seriously involved in competitive sports or wish to perform at an elite level. This standard of physical fitness enables them to perform optimally in their chosen activity. This type of fitness includes the components of:

• speed
• agility
• power
• balance
• coordination
• reaction time
• rhythm.

ACTIVITIES

1 Healthy and fit individuals

Working with a partner, use the Creating art weblink in your Resources section to develop a picture collage of individuals that you would consider to be healthy and fit. Alternatively, you may like to cut out images from magazines. When creating your collage, consider physical health, mental health, social health, spiritual health, health-related fitness and performance-related fitness.

2 Active workers

List six occupations that are active and explain how they help people remain physically fit while they work.

3 Venn diagram

Create a Venn diagram that explores how all the aspects of health are interrelated.
4 My physical health profile

Create a health profile for yourself and use it to set some goals.

1. Make a list of the regular exercise and physical activity you would do in a usual week.
2. Make a list of your diet in a usual week. Is your diet based on sound dietary guidelines?
3. Calculate your BMI using the following formula.

\[ \text{BMI} = \frac{\text{weight in kg}}{\text{height in m}^2} \]

Use the Heart Foundation BMI weblink in your Resources section to find out whether your BMI is within a healthy range.

Your waist measurement is closely related to your BMI. Checking your waist measurement is a simple predictor of how much fat is placed around your body. Use the Heart Foundation waist weblink in your Resources section to find out how to accurately measure your waist.

CHECK & CHALLENGE

Explain

1. In your own words, define physical health, mental health and health-related fitness.

Evaluate

2. How does being physically fit contribute to good physical, mental, spiritual and social health?
3. Evaluate the activities that have an impact on all areas of your health.
4. How can you build self-confidence through involvement in fitness activities? Give practical examples.

Elaborate

5. Why is having a positive self-image important for your mental health?
6. Describe how positive thinking can improve your social health.
5.2 Physical activity for health benefits

To maintain good health, we must have a balanced and nutritious diet, satisfying social relationships and a regular exercise regime.

**ENGAGE**

Physical activity is an important part of maintaining good overall health. High levels of sedentary behaviour can be dangerous to your health, as it is linked to developing chronic disease and obesity.

The *Australian Health Survey: Physical Activity, 2011–12* found that:

- Toddlers and pre-schoolers (aged 2–4 years) spent an average of around six hours per day engaged in physical activity. They also spent almost 1.5 hours in the sedentary activities of watching television and DVDs or playing electronic games.
- On average, children and young people (aged 5–17 years) spent 91 minutes per day on physical activity and over 136 minutes per day on screen-based activity.
- As children and young people get older, their levels of physical activity decrease and watching television, DVDs or playing electronic games (screen-based activities) increase.
- Only 25 per cent of boys and 8 per cent of girls (aged 5–17 years) met the recommended number of steps (12 000) per day.

Use the *Australian Health Survey* weblink in your Resources section to read major findings of the 2011–12 Australian health survey. How does your lifestyle compare with these results?

A greater level of physical fitness benefits an individual in many different ways. What are the physical activity guidelines for maintaining good health? What health benefits will be obtained?
EXPLORE

Benefits of physical fitness

Good physical fitness benefits a person in many ways, including:

- decreased risk of cardiovascular disease
- improved posture and body conditioning
- reduced body fat
- improved self-concept, body image and self-esteem
- improved mental wellbeing through reduction of stress and anxiety.

Decreased risk of cardiovascular disease

Cardiovascular disease (or heart disease) is the leading cause of death in our society and is directly related to inactivity. If you are active and physically fit, you decrease your risk of dying of heart failure. The National Heart Foundation recommends regular physical activity as a way of reducing the risk of heart attack, as being overweight places unnecessary stress on the heart. Regular exercise also helps to reduce high blood pressure, cholesterol and emotional stress levels. Use the Heart exercise eLesson in your Resources section to find out more about the benefits of exercise for young people.
Improved self-concept, body image and self-esteem

Physical activity can help improve your self-concept, body image and self-esteem. Being involved in physical activity with other club members, such as at a gym, in a team or in a recreational group, means you have a chance to build relationships with people who appreciate your abilities. This can help you feel secure and increase your confidence in yourself.

The National Physical Activity Guidelines

The National Physical Activity Guidelines (NPAG), first published in 1999, recommend that physical activity be undertaken on a daily basis and that this activity be accumulated throughout the day. This is a change of focus from previous guidelines, which recommended that activity levels focus on improving fitness rather than promoting and maintaining good health.

Use the NPAG weblink in your Resources section to explore these guidelines.

Walk with a friend.
Take the stairs, not the lift.

Try to include some vigorous activity every day.

DID YOU KNOW?

Results from the National Health Survey (NHS), which measured the height, and weight (BMS) of respondents aged 25 years or more, revealed that in 2011–12:

- 62.8 per cent of the Australian population (over 18 years) was either overweight or obese
• 35.3 per cent of the Australian population were classified as overweight (body mass index between 25.0 and 30.0 kg/m²)

• 27.5 per cent of adults were classified as obese (body mass index of 30.0 kg/m² or greater)

• 25.1 per cent of children aged 2–17 years are overweight or obese.

Dimensions of the National Physical Activity Guidelines

The National Physical Activity Guidelines require physical activity to be undertaken based on four dimensions.

• **Frequency** — how many times each week do you undertake physical activity?

• **Intensity** — at what intensity is the activity being performed; for example, at what speed or heart rate (measured as a percentage of maximum heart rate) do you perform the activity?

• **Duration** — for how long is the activity performed per session, day or week?

• **Type** — what form does the activity take? Is it sport-based (for example, netball, cycling, tennis or running) or more leisure-based (for example, gardening or walking the dog)? Physical activity can also be based on occupational requirements and household chores.

**DID YOU KNOW?**

The physical tiredness you feel after exercising isn’t the same as everyday fatigue. Once your body adjusts to exercise, you’ll have more energy than ever.

**Table 5.1: National Physical Activity Guidelines**

<table>
<thead>
<tr>
<th>Population group</th>
<th>Frequency</th>
<th>Intensity</th>
<th>Duration</th>
<th>Type</th>
</tr>
</thead>
</table>
| Children (5–12 years) and adolescents (13–17 years) | Every day | Moderate to vigorous | 60 minutes minimum, up to several hours, spread across the day | Wide range, including:  
  • aerobic  
  • weight-bearing (at least 3 days)  
  • some vigorous intensity activity.  
  *Note:* No more than two hours a day using electronic media for entertaining |
<table>
<thead>
<tr>
<th>Population group</th>
<th>Frequency</th>
<th>Intensity</th>
<th>Dimension</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults (18–64 years)</td>
<td>Most, if not all, days, 5 days minimum</td>
<td>Moderate</td>
<td>Accumulate 150 to 300 minutes of moderate intensity physical activity per week OR Accumulate 75 to 150 minutes of vigorous intensity physical activity per week OR An equivalent combination of both moderate and vigorous activities</td>
<td>A wide range of activities, including sports and leisure activities. Muscle strengthening activities at least 2 days a week.</td>
</tr>
<tr>
<td>Older adults (65 years and older)</td>
<td>Most, if not all, days, 5 days minimum</td>
<td>Moderate</td>
<td>30 minutes minimum, accumulated across the day. (For example, 3 × 10-minute sessions)</td>
<td>A wide range of activities that include fitness, strength, balance and flexibility</td>
</tr>
</tbody>
</table>

How can you do more for your fitness and wellbeing?
DID YOU KNOW?

Research has shown that watching TV for more than two hours a day when you are young is linked with being overweight, having poor fitness, smoking and having raised cholesterol in adulthood.

ACTIVITIES

1 National Physical Activity Guidelines (NPAG)

1. Use the NPAG weblink in your Resources section to access the NPAG website. Using information from this source, develop a table summarising the major information.
2. Replace some entries with blanks to test your classmates’ knowledge of the National Physical Activity Guidelines.
3. Quiz a fellow student or the class using your summary table.

2 Do you meet the requirements?

In pairs, develop a survey sheet using the dimensions of the National Physical Activity Guidelines. Survey the class and table the results. If many students do not meet the requirements, brainstorm practical lifestyle changes that address the gaps.

3 Promote it!

Create chants and slogans to promote more physical activity among young people. You can easily improve on the captions for the cartoons in this lesson.

4 How much TV?

1. Calculate how many hours of TV you watch on average each day.
2. Analyse your results. Do you watch more than the recommended limit?
3. If so, think of strategies to reduce this amount.

5 Body image

Explain how body image is interrelated with health and fitness. Use the Body image worksheet in your Resources section to help you write a report about having a healthy body image.
CHECK & CHALLENGE

Explain
1. Summarise the National Physical Activity Guidelines.
2. Explain the health benefits of physical activity.

Evaluate
3. Assess the pros and cons of adolescents limiting their use of electronic media. Why is it an important topic to consider?
4. How could your school increase the level of physical activity of students during recess and lunchtime?

Elaborate
5. Identify strategies to encourage others to be more physically active.
6. How are health and physical activity interdependent?

5.3 Assessing physical activity

It is important to assess the amount and type of physical activity we participate in. This gives us greater control over the choices we make about our physical health. Several methods are used to assess physical activity that differ for age groups and populations.

ENGAGE

As discussed in section 5.2, when assessing physical activity levels we must consider the dimensions of frequency, intensity, duration and type. We use these four dimensions to determine whether the individual is meeting the National Physical Activity Guidelines. Some methods of assessment have been developed for use by a wide variety of people and others have been developed especially for children.

Working with a partner, measure and record your breathing rate per minute (count for 30 seconds and then double it) and heart rate per minute (count for 30 seconds and then double it) at the completion of each of the following activities.

- Sitting still for one minute
- Walking for one minute
• Skipping for one minute non-stop
• Bent knee sit-ups for one minute

Consider the following:
• By how much did your breathing rate increase after skipping?
• What percentage of maximum heart rate did you achieve after each activity? (Max HR = 220 – your age)
• Rate each activity either as low intensity, moderate intensity or vigorous intensity.
• Draw a graph showing the relationship between heart rate and intensity of activity.

Use the Self-report worksheet in your Resources section to determine your activity levels.

A heart rate monitor measures exercise intensity; a pedometer measures the number of steps taken.

EXPLORE

Assessing intensity

Several methods are used to assess the intensity of physical activity undertaken.
Talk test

This method determines the extent to which a person has enough breath during the activity to be able to speak comfortably. This method can be used to gauge low intensity, moderate intensity and vigorous intensity levels.

- **Low intensity level** — a person should be able to sing while doing the activity.
- **Moderate intensity level** — a person should be able to carry on a conversation comfortably while doing the activity.
- **Vigorous intensity level** — a person should be too out of breath to carry on a conversation while doing the activity.

Target heart rate

This method determines whether a person’s heart rate is within the target zone during physical activity.

- **Moderate intensity level** — a person’s target heart rate should be 50–70 per cent of their maximum heart rate (MHR).
- **Vigorous intensity level** — a person’s target heart rate should be 70–85 per cent of their maximum heart rate.

*Note:* Maximum heart rate, or MHR, can be approximated by subtracting your age from 220, so a 15-year-old’s MHR would be 220 – 15 = 205.

Perceived exertion (Borg rating scale)

This refers to how hard you feel your body is working. It is based on the performer describing physical sensations felt during physical activity, such as an increase in heart rate, breathing rate, sweating and muscle fatigue. The rating scale is 6–20, where 6 is no exertion at all and 20 is maximal exertion.

Subjective methods of assessing physical activity

Subjective methods of assessing physical activity often depend on our own perceptions of physical activity. They are predominantly used for measurement in populations.

Self-report

This includes a variety of assessment methods, such as physical-activity diaries, questionnaires (conducted by either an interviewer or the individual) and reports provided by others (for example, parents reporting on activity levels of children).

Diaries or logs provide a detailed record of individual physical activities undertaken in a given day, more or less as the activities are completed, or soon after.
Recall
This method usually consists of short, simple questionnaires of approximately 5–15 items that take up to 15 minutes to complete. They seek to investigate physical activity patterns in the recent past (for example, the last week or month). The main aims of this method are to:

- provide basic data that can be used to assess physical activity patterns in large populations
- allow public health agencies to provide an overview of physical activity patterns across large groups within the community.

Objective methods of assessing physical activity

Objective methods of assessing physical activity often rely on solid data or observations. These are predominantly used for measurement in individuals.

Direct observation
An experienced observer is used to collect data that measures the individual’s type of activity, intensity levels, time of activity and environmental conditions.

Heart-rate telemetry
The subject wears a device that provides data on their heart rate response to physical activity. Heart-rate telemetry is a valid method to assess physical activity, as a person’s heart rate provides a direct indicator of the physiological response to physical activity.

Pedometry
The subject wears a pedometer that records the number of steps taken and estimates the distance walked if their stride length is known. Pedometry can also be used to estimate physical activity energy expenditure by estimating the energy cost associated with walking.

DID YOU KNOW?
Washing the car, vacuuming the house and walking the dog are all activities that have a moderate intensity level.
ACTIVITIES

1 Daily steps

1. Using a set of class pedometers or your digital device, have six subjects wear a pedometer to determine the number of steps they take in a day. If using class pedometers, ensure they are labelled for each subject and sealed to discourage tampering.

2. As a class, record the results in a table.

3. Discuss the advantages and disadvantages of using pedometers as a tool to assess physical activity.

2 Comparing activity levels

1. Interview a working adult and use the Self-report worksheet in your Resources section to complete the self-report for your subject. Compare his or her activity time to your own.

2. Interview a grandparent and complete the same report for him or her. Compare it to both your own and the working adult’s.

3. How does activity time change as people grow older?

3 Activity diary

1. Keep an activity diary for a day. Record all the physical activity in which you participate (even small things like walking between classes).

2. Swap diaries with another student in the class. Suggest practical changes to improve your partner’s physical activity levels.

4 Subjective ranking

Categorise the people listed below as:

- unfit
- moderately fit
- fit
- very fit.

You will need to think about what fitness means and estimate the fitness gained from each person’s daily activities and commitments. Definite conclusions may be difficult to reach as
‘fitness’ can be achieved in many different ways. Use the National Physical Activity Guidelines to help your evaluation.

a. James, a business executive, who plays competitive squash twice weekly
b. Martha, aged 64, who swims daily for one hour and cycles every morning
c. Su-Li, a secretary, who attends three aerobics classes each week
d. Cadel Evans, a world-class distance cyclist
e. Ben, a postie, who works on a bicycle
f. Wei, a Year 12 student, who plays social sport at lunchtimes and golf once a week
g. Robert, aged 15, who plays for both his school and local football teams
h. Mrs Suzie Watson, a PE teacher at a secondary college
i. Brett Lee, world-class cricketer
j. Myrna, busy mother of four, who does not schedule activity time
k. Chris Judd, AFL footballer
l. Sandra, competitive bodybuilder
m. Roger Federer, world-class tennis player
n. Arthur Smith, champion arm-wrestler and darts player

CHECK & CHALLENGE

Explain

1. Explain ways in which you could assess physical activity in the areas of frequency, intensity, duration and type.

Evaluate

2. Compare the advantages and disadvantages of using heart rate telemetry and the talk test for measuring intensity levels of physical activity.

Elaborate

3. Self-report is one way to assess your physical activity level. However, this method is not suitable for younger children and older adults. Why? What methods might be more suitable?
5.4 Barriers to participation in physical activity

There are many reasons why people fail to participate in the recommended levels of physical activity. However, theoretical models can show how behavioural change may lead to increased activity levels.

ENGAGE

Have you noticed that some people find it easy to start regular physical activity and will stick with it, while others find it hard to even start, let alone continue participating once they have begun? In a small group, brainstorm a list of barriers an individual may encounter that limit physical activity levels.

Use the **Precontemplation checklist** worksheet in your Resources section to think about your involvement in physical activity and consider what barriers are holding you back.

Changing behaviours to think of movement as an opportunity, not an inconvenience, requires support with a long-term vision.

EXPLORE

Physical activity takes many forms. It can be something as simple as walking or something as sophisticated as downhill skiing or skydiving. Failure to engage in recommended activity levels could be due to:

- income or the cost of the activity
• geographic location
• climate
• lack of fun and enjoyment in the activity
• lack of time
• injury
• lack of encouragement and support
• low self-efficacy
• poor coaching or equipment.

Too much work can be a barrier.

Theoretical models help to explain how behavioural changes and factors may lead to increased activity levels. The models presented in this section explain how people may be assisted and encouraged to find opportunities for movement on a daily basis by changing their attitudes and behaviour.

The stages of change model

The transtheoretical model (Prochaska and Marcus, 1994) describes the stages that people go through as they change their health behaviour, and provides a framework that classifies motivational readiness for behaviour change.

Most people move through a series of six stages of readiness as they change behaviour:

1. precontemplation
2. contemplation
3. preparation
4. action
When adding physical activity into their life, losing weight or regaining their fitness, what helps someone in one stage may not work for someone in another stage. A more detailed analysis of the (transtheoretical) stages of change model is given in the figure below.

When considering the six stages of readiness, note that:

- each stage takes a period of time to acquaint yourself with new behaviours
- effort and commitment are required at all stages
- you will move through each stage in your own time
- you may not always move forward in a straight line; there will be times when you lapse and go back to an earlier stage. However, this is expected.

Source: Adapted from the National Centre for Chronic Disease Prevention and Health Promotion, USA, 2003.

Stages that represent the path to adopt regular physical activity into your life

**Stage 1: Precontemplation — not ready for change**

As the name suggests, you are not ready for change right now. You are not even thinking of introducing physical activity into your daily routine. You may even have tried in the past to do so, with little success. Now is the time to start considering the pros and cons of being more active.
Stage 2: Contemplation — thinking about change

This stage is reached when you start thinking about incorporating regular physical activity into your life.

DID YOU KNOW?

Research shows that even if they do the recommended 30 minutes of exercise a day, men who are bound to their desk all day are likely to end up overweight. A survey of 1579 Australian workers found men who sat at their desks for six or more hours a day were 90 per cent more likely to be overweight or obese than those who sat for less than 45 minutes a day.

Stage 3: Preparation — preparing for action

After weighing all the pros and cons and thinking about how changes can occur, people at this stage appear to be ready and committed to action. A plan is developed, ready for implementation.

Stage 4: Action — carrying out your plans

You have developed a plan of action and are now implementing it. At this stage, it is important to focus on your goals to keep you on the right track.

Stage 5: Maintenance — maintaining a good thing

Regular physical activity has become part of who you are. You have made a commitment to physical activity and are reaping the benefits.

Making exercise fun and social helps with motivation.
Accomplishing new activities can lead to an increase in self-esteem.

Stage 6: Termination — maintaining regular activity for more than five years

You have incorporated regular physical activity for over five years. It is now part of your life.

The social–ecological model

The social–ecological model is a framework that enables you to understand the numerous factors and behaviours that act as barriers to or enable participation in physical activity. This model focuses on four components that influence physical activity:

- individual
- social environment
- physical environment
- policy
Individual component

The individual is at the centre of the model. This component includes personal factors that influence physical participation including:

- age
- gender
- level of education
- level of self-efficacy
- sports skills
- attitudes.

Social environment component

The social environment component is the next external force that acts on the individual. The social environment component refers to the influence of people around the individual. This component has a significant influence on physical activity behaviour and includes:

- family
- peers
- schools/workplaces
• cultural backgrounds
• socioeconomic status of community.

Physical environment component

The physical environment component focuses on the natural and human-made areas, and is likely to influence the amount and type of physical activity an individual does. The physical environment component includes:
• weather
• geography
• access to facilities
• design of the communities
• access to public transport.

Policy component

The policy component refers to legislation that can have the potential to affect physical activity. These are often policies at workplaces or schools or within a community that increase access to physical activity. Policy component includes:
• education/school policies
• workplace policies
• urban planning policies
• environmental policies
• health policies.

The social–ecological model is based on four core principles:
• Behaviours are influenced by a number of factors.
• Social and physical environments are complex and multidimensional.
• The model includes all of the multiple levels of human interactions with the various environments.
• The interrelationships between people and the environments are dynamic.

Therefore to change physical activity behaviour we need to target a number of components. Physical activity interventions are more likely to be successful when they target multiple components of the social–ecological model.

Self-efficacy

Self-efficacy helps to explain why some people can commit to regular physical exercise and why some people struggle to do so.
Self-efficacy can be described as a person’s belief in their ability to be active across a range of challenging situations. It involves our behavioural skills as well as the psychological belief/confidence in our ability to be active. People with low self-efficacy lack confidence in their ability to be physically active in adverse conditions (for example, when it is raining, or they are feeling unwell). These feelings may be due to:

- previous failure to adhere to regular physical activity
- a perceived lack of ability to perform the physical activity
- observation of and comparison with other participants
- lack of social and verbal encouragement relating to task performance
- lack of physiological arousal or sense of involvement, for example, due to a perceived lack of ability
- the lack of necessary skills required to perform the activity.

**Overcoming low self-efficacy**

Strategies exist for overcoming low self-efficacy.

- Select activities that you feel confident in performing, so that you will be more prepared for adversity.
- Develop strategies/solutions to help overcome situational barriers. For example, what will you do if you become unwell or you have no-one to exercise with?
- Work with a trainer/coach to develop skills and receive encouragement.
- Inform friends and family of your physical activity plans and ask for their encouragement.
- Forget about the past. Take steps forward!

**ACTIVITIES**

1. **Barriers to participation survey**
   In groups, develop a survey sheet to determine the barriers to participation for students at your school. Survey two different year levels, then graph and discuss the results.

2. **Move about**
   Head researcher Professor Kerry Mummery, from Rockhampton’s Central Queensland University, said adults needed to find new ways of dealing with obesity, one of society’s biggest problems. Professor Mummery’s tips for getting more exercise at work include the following.
• Plan your day to incorporate more physical activity, no matter how small. Walk to the train station or bus stop instead of driving. Try walking to the next train station.

• Make a habit of moving from your desk at intervals during the day. Walk over to the photocopier or printer instead of delegating the task. Get your own coffee or water bottle.

• When communicating with colleagues in the same building, get up and walk over to their desk instead of sending an email or calling them.

• Take the stairs rather than the lift.

• Walk outside to have your lunch rather than eating at your desk or even in the lunchroom.

Professor Mummery’s five tips are for adults at work. Suggest how you could modify each tip to make it relevant to you in your day-to-day life.

CHECK & CHALLENGE

Explain

1. Explain how each of the following might affect participation in physical activity or choice of activities.
   a. Income
   b. Geographic location
   c. Low self-efficacy

2. Explain how the four components of the social–ecological model can influence physical activity.

Elaborate

3. Using the stages of change model, identify characteristics of individuals who might be at each stage.

4. Using the social–ecological model, suggest a student intervention strategy for each component, with the aim of improving physical activity in your school.

Evaluate

5. For each stage of change, provide strategies to assist an individual to progress to the next stage.
Physical fitness can be either health related or skill related. To determine a thorough fitness profile, we need to measure fitness capabilities across a number of areas.

ENGAGE

Physical fitness consists of a number of different areas or components, which can be divided into those that are health related and those that are skill related. These are listed in table 5.2 below.

Table 5.2: Components of physical fitness

<table>
<thead>
<tr>
<th>Health-related components</th>
<th>Skill-related components</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cardiorespiratory endurance</td>
<td>• Speed or anaerobic power</td>
</tr>
<tr>
<td>• Muscular strength</td>
<td>• Agility</td>
</tr>
<tr>
<td>• Local muscular endurance</td>
<td>• Balance</td>
</tr>
<tr>
<td>• Flexibility</td>
<td>• Coordination</td>
</tr>
<tr>
<td>• Body composition</td>
<td>• Reaction time</td>
</tr>
<tr>
<td></td>
<td>• Muscular power</td>
</tr>
</tbody>
</table>

Use the Lauren Jackson, Amelia McGrath and champion snooker player Neil Robertson weblinks in your Resources section to see these sportspeople in action. In small groups, discuss the main fitness components these athletes would display. List two fitness tests that could be used to measure each athlete's physical capabilities in their respective sports. Explain your reasons for selecting those fitness tests.
Australian gymnast Amelia McGrath in action during the Pacific Rim Championships in 2010

Champions in many sports, such as Lauren Jackson of the Australian Opals basketball team, have well-developed fitness components.

EXPLORE

Health-related fitness components

Fitness components are aspects of fitness that affect performance in any sport or recreational activity. To analyse what is required for basketball, gymnastics, snooker or any other physical activity, you need to recognise the fitness components most relevant to the activity. This is because fitness is specific to performers’ needs; for example, the fitness required by an elite gymnast is different from the
fitness needed to play professional basketball. Once you know the specific fitness demands of a particular activity, you can physically prepare for the activity. Use the **Components of fitness** interactivity in your Resources section to explore the fitness components of different sports.

**Aerobic endurance** is the capacity of the body to keep up continuous physical activity over an extended period of time at a low to medium intensity. This requires efficient functioning of the heart and lungs and can be increased through participation in activities such as jogging, cycling and swimming. Athletes who require a high level of aerobic endurance are hockey, soccer and football on-ball players, and distance athletes such as road cyclists, triathletes and rowers.

**Muscular strength** is the ability of the muscles to exert a single maximal force to overcome resistance. The resistance may be a body part, the weight of the whole body, or an item external to the body. The heavier the weight the muscle can lift and the more resistance it can overcome, the more strength it is said to have. Strength assists performance in many sporting and recreational activities. Competitive weightlifting is a contest of pure strength.
Local muscular endurance (LME) is the ability of a muscle or muscle group to sustain or repeat a force over a long period of time. LME for a specific movement may be increased by increasing the time the force is sustained. LME is required in many sports but is crucial in team games and long-duration events such as triathlons.

Flexibility is the range of movement about a joint. It varies from joint to joint within the body. Flexibility is greatest at birth and diminishes from then on, though to a lesser extent in active people.

All athletes should aim to have good flexibility, as it reduces the amount of muscle stiffness and soreness, and reduces the chance of injury. Gymnasts and dancers often show outstanding levels of flexibility.

Body composition refers to the ratio of fat to non-fat components in the body. Body fat consists of essential fat in and around organs such as the heart, and storage fat found in fat cells around the body. Non-fat components make up your lean body weight and include muscle, bones and organs.
Skill-related fitness components

Speed can refer to whole-body speed (100-metre sprint), where the aim is to move from point A to point B as quickly as possible, or part-body speed (discus throw), where one or more parts of the body move as quickly as possible to complete a movement.

**Balance** is the ability to remain in a state of static or dynamic equilibrium; skiers, horse-riders, gymnasts and surfers need good balance.

**Agility** is the ability to start, stop and change body positions quickly without losing balance; trampolinists and dancers require agility skills. Games that involve dodging opponents also require agility, such as netball, basketball and hockey.

**Coordination** is the ability to link a series of actions into a flowing movement pattern with appropriate timing and accuracy. Hand–eye coordination is vital to racquet sports; football players need to coordinate the placement of the ball onto the kicking foot; basketballers need to coordinate the timing of the release of the ball while making a jump shot. All sports need coordination skills.

**Reaction time** is the time that it takes for an athlete to respond to the signal that movement is required; for example, a sprinter’s reaction to the sound of the starting gun, or the time it takes for a soccer goalie to leap into action to save a goal.

**Muscular power** is the combination of strength and speed. A powerful movement is achieved as quickly as possible, while imparting as much strength as possible. Jumping and throwing activities rely on muscular power.

DID YOU KNOW?

The multi-stage fitness test is also known as ‘Beep Test’ and ‘Yo-Yo Test’, and was developed by L. A. Leger and J. Lambert in 1982.

Fitness profile

To determine your present state of physical fitness — that is, to create a fitness profile — you will have to measure some of your fitness capacities. This is done in the format of a laboratory exercise. Watch the eLessons in your Resources section to view lab tests for each fitness component.

Laboratory exercise measurements must be carried out accurately. Listen to all instructions carefully. The most effective way is to work in a pair or group of three people, depending on the exercise. Watch the exercise method closely and collect all the equipment you will need. The ‘subject’ is the person physically completing the exercise. The subject should concentrate on the physical task; the other group member(s) should conduct the test using the correct protocol and record results immediately. Plenty of encouragement will help the subject to do his or her best.
Fitness tests

Remember, the purpose of completing these measurements is to compile a ‘picture’ of your fitness level. Laboratory exercises are not designed to provide competition between classmates.

### Table 5.3: Fitness tests

<table>
<thead>
<tr>
<th>Fitness components</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic endurance</td>
<td>• The 20-m shuttle run test</td>
</tr>
<tr>
<td></td>
<td>• The 1.6-km run/walk</td>
</tr>
<tr>
<td>Muscular strength and power</td>
<td>• Standing long jump</td>
</tr>
<tr>
<td></td>
<td>• Grip strength dynamometer</td>
</tr>
<tr>
<td></td>
<td>• The basketball throw</td>
</tr>
<tr>
<td></td>
<td>• Vertical jump</td>
</tr>
<tr>
<td>Local muscular endurance (LME)</td>
<td>• Push-ups on chair</td>
</tr>
<tr>
<td></td>
<td>• Curl-ups</td>
</tr>
<tr>
<td>Flexibility</td>
<td>• Sit and reach</td>
</tr>
</tbody>
</table>

© John Wiley & Sons Australia, Ltd
<table>
<thead>
<tr>
<th>Fitness components</th>
<th>Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skill-related fitness</td>
<td>• Hand wall toss (coordination)</td>
</tr>
<tr>
<td></td>
<td>• 50-metre sprint (speed)</td>
</tr>
<tr>
<td></td>
<td>• Illinois agility run (agility)</td>
</tr>
<tr>
<td></td>
<td>• The stork stand (balance)</td>
</tr>
</tbody>
</table>

**ACTIVITIES**

1 Motivating goals

A fitness program will be more successful if you have goals and motivation. Brainstorm reasons why people would want to be more powerful or flexible, or have more strength, endurance and cardiorespiratory fitness.

2 Fitness profile

1. How fit do you think you are? Predict your level of cardiorespiratory fitness, muscular strength and power, local muscular endurance, flexibility and performance-related fitness.
2. Use the Fitness profile worksheet in your Resources section to undertake a number of fitness tests and create your fitness profile.
3. How accurate were your predictions? Use your fitness profile to set some realistic fitness goals.

**CHECK & CHALLENGE**

Explain

1. Define aerobic endurance, muscular strength, flexibility and local muscular endurance. Name a sporting event for each fitness component.
2. Explain why fitness tests need to be carried out accurately.

Evaluate

3. Using your fitness profile, list the activities you believe necessary to enhance your fitness components. Justify your choices.
4. The objective of the multi-stage fitness test is to monitor and estimate the athlete’s maximum oxygen uptake (VO₂ max). Use the internet and other sources to find out what this means.

Elaborate

5. All athletes should maintain a good level of flexibility. Identify three reasons why flexibility is important for athletes.

5.6 Training principles

When planning a training program, you need to understand and apply the primary principles of training to gain the greatest benefit from your program.

ENGAGE

Training principles are critical for gaining benefit from training. If the key principles of training — frequency, intensity, duration, specificity and progressive overload — are not applied correctly, the likelihood of achieving the desired training outcome is diminished.

In small groups, discuss the following points. Jot down any unfamiliar terms and investigate their meaning.

• If you tested a marathon runner for cardiorespiratory endurance, which would produce the better result: a swimming test or a treadmill (running) test? Why?

• How would you train a rower for maximum results in cardiovascular endurance?

• How do you overload a program when training for cardiorespiratory endurance?

• How would the type of training completed by rowers and swimmers (who require the ability to keep their arms moving continuously for long periods of time) differ from the type of training completed by throwers (who require power)?

• A gymnast requires sustained muscular endurance. How would her training activities differ from those of the others?
Elite endurance athlete Craig Mottram requires a high level of aerobic endurance.

EXPLORE

Principles of training for sporting events and activities

The key principles of training are:

- frequency
- intensity
- duration (time)
- type
- specificity
- progressive overload.

FIDT — frequency, intensity, duration and type

As discussed in section 5.2, frequency is how many sessions per week you complete. The normal training frequency for improving aerobic fitness is three to five sessions a week. The normal frequency for improving anaerobic fitness, including strength and power, is three to four sessions a week.

Intensity is the exertion level at which the training is performed. It is gauged as a percentage of your maximum heart rate (MHR).

- Aerobic energy system (long duration energy system) — 70 to 85 per cent MHR
- Anaerobic glycolysis system (moderate duration energy system) — 85 to 95 per cent MHR
• Phosphate energy system (short duration energy system) — 95 to 100 per cent MHR

The various generic training zones according to age and heart rate

**Duration** is the length (in time) of each training session. To increase cardiorespiratory endurance, you should complete a minimum of three sessions per week. Each session should consist of at least 20 minutes of work with the heart rate at 70 to 85 per cent MHR. This is a guideline.

**Type** refers to what kind of exercise you should do to help improve your performance. To improve endurance, for example, you need to include aerobic exercises such as running in your program. To improve muscular strength, you need to include weight training exercises to stress the neuromuscular system.
FIDT — frequency, intensity, duration and type. Observe these four guidelines and you will be well on the way to becoming FIT!

DID YOU KNOW?

Exercise increases energy levels and increases serotonin in the brain, which leads to improved mental clarity. Research has discovered that the fittest students generally score the highest in exams.

Specificity

When selecting activities for a training program specific to your sport (known as specificity), there are two things to consider for the best results.

First, the energy demand of the main training activities must be specific to the energy demand of the activity. For example, if you were training for netball, which consists mainly of short, full sprints to the ball or away from your opponent, the training program should emphasise anaerobic (or sprint) activities. In this way, the energy demand of the training program matches that of the netball game.

Second, you need to identify the muscle groups used in the skills required in your sport, and keep your training specific to these muscles. If the sport you are training for requires continuous contractions of the leg muscles, then the training routine should use the legs in actions that are as close as possible to the actual leg movements required during the competitive situation. The most
vital type of training for marathon runners is continuous running. A long jumper, on the other hand, requires a single explosive contraction of the leg muscles simultaneously to achieve the longest possible jump. The long jumper’s training would obviously require less continuous running. The training program would include activities that develop leg power. Leg power is increased by developing leg strength and the speed at which this increased strength can be applied. The long jumper’s program may include weight training and jump practice.

Long jump requires a single explosive contraction of the leg muscles.

Rowers, swimmers, javelin and discus throwers, shot-putters and gymnasts all use their arms during competition. Therefore, arm work is vital in a specific training program. The group(s) of muscles to be used and the duration and intensity of training activities must both be specific to the needs of the sportsperson under performance conditions.

**DID YOU KNOW?**

The minimum duration for aerobic improvement is six weeks, although it is more likely to be twelve weeks. For anaerobic improvement, including strength and power, six to eight weeks of training produces noticeable improvement.

**Progressive overload**

The principle of **progressive overload** is that your level of fitness can improve only if you exercise at an intensity greater than your existing capacity. If muscle strength, endurance and size are to increase, the muscle must be worked at an ‘overload level’. The muscle must be lifting a greater weight than normally encountered, or completing more repetitions than usual, if strength and endurance are to progressively increase.

When starting a training program for strength, the muscle(s) being trained will quickly gain strength and be able to overcome the resistance of the starting weight more easily. Applying the progressive overload principle means that the weight lifted by the muscle(s) is continually increased as muscle strength continually increases. To increase the ability of a muscle to contract continuously, the
The number of repetitions of an exercise is continually increased from training session to training session. This is progressive overload when training for muscular endurance.

NRL player Nathan Merritt, training at the AIS. The weight lifted by the muscle must continually increase.

### ACTIVITIES

1. **Training for field games**
   1. As a class, play a game of hockey, netball and soccer.
   2. Identify the muscle groups, skills and training programs that are used in each sport.
   3. Discuss how the training for hockey, netball and soccer would differ from each other.

2. **Target heart rate**
   
   Use the [Target heart rate calculator](#) weblink in your Resources section to calculate your target heart rate needed to develop your:
   1. aerobic energy system
   2. anaerobic glycolysis system
   3. phosphate energy system
4. weight control zone

5. fat-burning zone.

You are then required to wear heart rate monitors and conduct various activities that keep
your heart rate in the required zones, including a continuous exercise and a team sport.
Discuss how maintaining these different target heart rates can have an effect on your health,
wellbeing and fitness. Discuss how your heart rate differed between the continuous
exercise and the team sport. Why do you think they were different?

3 Exercise heart rate

1. Jog, swim or cycle for five minutes.

2. Measure your heart rate at the end of the second, fourth and fifth minute. To do this
efficiently, measure your heart rate for 10 seconds and then multiply by six.
Alternatively, use a heart rate monitor for a more accurate reading.

3. Is your heart rate below, at or above the target heart rate? If it is below, you can work a
little harder. However, do not raise your heart above 180 bpm for a prolonged period of
time.

4. Why are some people more easily able to reach this target heart rate?

4 Graph analysis

Examine the graph below, which shows the fitness level of six subjects over a period of
time.

1. Describe the progress of each subject during their training program.

2. Use the graph to consider the following points for each subject.
   a. Initial training load
   b. Adjustments made to training load
   c. Whether there was any change in training load
   d. Whether the training load was too easy or hard

3. Comment on the usefulness of the graph. Can the conclusions drawn in the previous
question be backed up by the data presented?
CHECK & CHALLENGE

Explain
1. List and explain the five training principles.
2. What two components of fitness may be improved to increase leg power?
3. How would muscular endurance training for swimmers and rowers differ from power training for a shot-putter?

Evaluate
4. List and explain three ways of putting the principle of progressive overload into action when training for aerobic power.

5.7 Training methods

Determining the training methods that will be incorporated into your training program is the next step to increasing your fitness. It is important to understand each method when designing an appropriate and successful training program.
ENGAGE

For training programs to be successful, they must be properly planned and correctly apply the training principles and methods, so that the athlete achieves maximum results.

Different methods of training will develop different fitness components.

Training methods describe different types of training undertaken to achieve the desired improvement in fitness. The methods include:

• resistance or weight training
• plyometric training
• circuit training
• interval training
• continuous training
• flexibility training.

Use the Star training eLesson in your Resources section to watch some clips showing different types of training. For each clip, determine what type of training the athlete is doing.
EXPLORE

Resistance (weight) training

Resistance training (or weight training) aims to build strength, power or local muscular endurance by exercising muscles against a resistance. The muscles contract to lift a dumbbell, barbell, the weight of the body or a body part.

The following table is a guide for weight training. In particular, consider how the repetition maximum (RM), repetitions and sets differ for the development of muscular strength, power and endurance.

Table 5.4: Weight training guidelines for muscular strength, power and endurance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Muscular strength</th>
<th>Muscular power</th>
<th>Muscular endurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>85–100% RM</td>
<td>30–70% RM</td>
<td>50–60% RM</td>
</tr>
<tr>
<td>Exercises</td>
<td>3–5</td>
<td>2–4</td>
<td>4–6</td>
</tr>
<tr>
<td>Repetitions</td>
<td>1–4</td>
<td>4–12</td>
<td>15–100</td>
</tr>
<tr>
<td>Sets</td>
<td>3–10</td>
<td>3–6</td>
<td>2–4</td>
</tr>
<tr>
<td>Rest and recovery</td>
<td>3–6 minutes</td>
<td>2–6 minutes</td>
<td>2 minutes</td>
</tr>
<tr>
<td>Speed of exercise</td>
<td>Slow to medium</td>
<td>Fast</td>
<td>Medium</td>
</tr>
<tr>
<td>Frequency</td>
<td>2–3 times a week</td>
<td>2–3 times a week</td>
<td>2–3 times a week</td>
</tr>
</tbody>
</table>

Plyometrics

Plyometrics can also be used to develop power, especially in the legs. Activities such as bounding, hopping and depth jumping can be used. Plyometric training should be carried out only under supervision, as the strength and technique required to perform the activities can cause injury if not performed correctly.

Circuit training

Circuit training is another method of training that can be used to develop many components of fitness. Circuits can be designed to include many types of activities and equipment that may be specific to a particular sport or activity.

Interval training

Interval training can be used to improve aerobic or anaerobic fitness. It involves periods of work interspersed with periods of rest. Short interval training with long rests to replenish the ATP–CP system (also known as the phosphate system, see section 5.6) would be used to improve speed and to train the ATP–CP system. An example of this would be to perform eight 60-metre sprints in approximately eight seconds, with a 60-second recovery period. Note that this rest period would
not allow full replenishment of the ATP–CP system, but partial replenishment is all that is required to complete the eight repetitions.

Table 5.5 can be used to assist planning for short interval training.

**Table 5.5: Planning for short interval training**

<table>
<thead>
<tr>
<th>Duration of work period</th>
<th>Up to 10 seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of work</td>
<td>90–100% MHR</td>
</tr>
<tr>
<td>Duration of recovery period</td>
<td>1–2 minutes</td>
</tr>
<tr>
<td>Work/rest ratio</td>
<td>1 : 5 to 1 : 12</td>
</tr>
<tr>
<td>Repetitions</td>
<td>5–15 per set</td>
</tr>
<tr>
<td>Energy system used</td>
<td>ATP–CP system</td>
</tr>
</tbody>
</table>

For endurance activities, longer intervals can be carried out. Table 5.6 may assist when planning for longer interval sessions.

**Table 5.6: Planning for longer interval sessions**

<table>
<thead>
<tr>
<th>Duration of work period</th>
<th>0.5–5 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of work</td>
<td>80–85% MHR</td>
</tr>
<tr>
<td>Duration of recovery period</td>
<td>0.5–5 minutes</td>
</tr>
<tr>
<td>Work/rest ratio</td>
<td>1 : 1 to 1 : 2</td>
</tr>
<tr>
<td>Repetitions</td>
<td>5–20 per set</td>
</tr>
</tbody>
</table>
| Energy system used      | • Anaerobic glycolysis system  
                          | • Aerobic energy system |
An example of an endurance circuit for general fitness and muscle toning. Work through the circuit from 1 to 8, then repeat.

**Continuous (aerobic) training**

Aerobic training can be improved by carrying out continuous training. The main types of continuous training are:

- running and jogging
- cycling and swimming
- floor classes such as aerobics
- gym circuit classes.

Continuous training should be carried out for a minimum of 20 to 30 minutes at an intensity of 70 to 85 per cent of maximum heart rate, with a minimum of three training sessions per week.
Flexibility training

Flexibility training is an essential component in all active sports and is about improving the range of motion at the desired joints that are important for maximum performance. There are four recognised methods of stretching. These are:

- passive stretching
- active stretching
- proprioceptive neuromuscular facilitation (PNF) stretching
- ballistic stretching.

Use the Which stretch? eLesson in your Resources section to watch clips of different stretches.

Designing a training session

The most important part of the training program is the actual training sessions. All training sessions should include a:

- warm-up component
- conditioning component
- stretching and cool-down component.

Warm-up

Before beginning any training program, a warm-up must be completed, including flexibility exercises. Similarly, at the completion of training, a cool-down should be performed.

Warm-ups should be dynamic and include a series of movement drills or activities that build from low to moderate intensity. The activities should enable the athlete to move all body parts and joints through the range of movement performed during the game or performance. The warm-up should be specific to the physical activity that will follow. For example, AFL footballers place an emphasis on activities that take the groin and hamstring muscles through their full range of movement because of the fast, forceful kicking actions and sidestepping movements in a match. Gymnasts place emphasis on activities that take the lower back through its full range of movement, because many of the skills they will perform will hyperextend the spine.

Conditioning

The training session must include developing or maintaining the specific fitness components required for the particular sport or activity.
Stretching

Static stretching stretches the muscle to a comfortable limit and holds it there for a minimum of 15 to 20 seconds. At least three repetitions of each static stretch should be completed. There should be no bouncing in this method. Bouncing can take the extended joint beyond its safe limit and cause muscle soreness or tearing.

Cool-down

If you suddenly stop strenuous physical work, blood may pool in the extremities of your body, causing dizziness or faintness. This can be avoided by gradually decreasing the intensity of the physical work by doing a slow five minute jog, cycle, swim or walk and finishing the session with static stretching. Static stretching during the cool-down helps increase flexibility and may reduce muscle stiffness and soreness. Stretching should involve all major parts of the body and specifically address key areas for your sport/activity as well as you as an individual.

DID YOU KNOW?

There are three types of weight training:

- **Isotonic weight training** — uses free weights such as barbells and dumbbells
- **Isometric weight training** — involves holding the muscle in one position while it contracts against the resistance
- **Isokinetic weight training** — undertaken by machines such as Cybex or Hydra-Gym, which adjust the load as the body part moves through the range of motion.

Myths associated with fitness and training

Many myths surround fitness and training. The new research appearing regularly about fitness and training means it is important to debunk the myths and use the correct information available to you.

- **No pain, no gain.** Research shows that there is no need for training to be painful. In fact, the statement should read ‘no gain, if pain’. If pain is present when training, it is time to slow down. In some cases, if pain persists, obtain medical advice.

- **Exercise increases appetite.** This is often the reverse after exercising. After exercise, especially in warm conditions, you often want to drink water rather than eat. Exercise therefore can reduce the desire for food.

- **I can ‘spot-reduce’ if I exercise one area.** Often, people believe that they can take off weight in a particular area; for example, doing sit-ups will remove weight around the stomach area. Weight loss is obtained only through a balanced diet and exercise program. Spot reduction doesn’t occur.
• **Women who train with weights become muscle bound.** Training with weights may increase strength. However, females are unlikely to ‘bulk up’ as much as men due to the absence of testosterone, which helps with muscle growth.

• **Exercise is costly, time consuming, arduous and is only for people who are fit.** Exercise can cost nothing, for example, walking. No special shoes or clothing are required. Using your own body weight instead of weights also reduces the cost of exercising. People who aren’t fit need to exercise, as the fitness benefits can help with their everyday lives. If you vary the exercise you undertake, you lessen the possible arduous nature of exercise.

• **An active occupation is an acceptable indicator of fitness level.** It doesn’t mean someone is fit, just because they are active in their job. We know that, to maintain aerobic fitness, exercise needs to be of a continuous nature for 20 to 30 minutes a day, at least three times a week. Very few occupations provide this. Being fit also means more than just aerobic fitness. Other health-related fitness concepts such as acceptable body fatness, muscular strength and good flexibility are also important.

• **It worked for them, it’ll work for me.** We need to individualise programs because everyone has different needs and aspirations. Health screening and fitness testing must be used to assess strengths and weaknesses.

• **Weight loss without effort.** Many centres have tried to convince people that their machines will reduce weight without effort. Unfortunately, there is no magic way of reducing your weight other than by reducing your intake of kilojoules and, at the same time, increasing the amount of energy you use by exercising. This exercise must be above resting levels for the body to burn more energy than it takes in.

• **Females and physical activity.** Another myth is that females will damage their reproductive organs and weaken their bones if they exercise, and that all exercise should stop when menstruation occurs. No evidence has shown that reproductive organs are affected by exercise, and weight-bearing exercise actually strengthens bones. Exercising during menstruation can help reduce discomfort that may occur during menstruation.

• **By not drinking I can lose weight.** Fluid replacement during and after exercise is extremely important. Dehydration can occur if the fluid balance isn’t maintained. Even moderate fluid loss, probably unnoticed by many athletes, will impair performance levels, especially in hot conditions. During intense exercise in warm environments, an athlete can lose one or two litres of fluid per hour. The amount of fluid required can be determined by weighing yourself before exercise and then immediately after exercise. The amount lost during exercise needs to be replaced. For example, if you lose two kilograms in weight, two litres of fluid is required to maintain your fluid balance. Drinking small amounts during exercise is also important. Drinking regularly rather than when you become thirsty is recommended. You will probably find 150 to 200 millilitres is usually a comfortable amount. Water is a suitable drink for events of less than an hour; sport drinks and cordials may also be used.
ACTIVITIES

1 Myth busters

1. What myths about fitness training have you heard? As a class, brainstorm a list of myths you have heard and discuss how you could debunk it.

2. In groups of three, role play a conversation about a common myth. One person should play the gullible myth-believer, another person a charlatan benefiting from the myth and the third person a knowledgeable sports scientist who explains why the myth is erroneous.

2 Resistance training

Design and undertake a resistance training program for yourself, incorporating the relevant principles of training. Use the Workout card worksheet in your Resources section to monitor your progress. Justify your choice of activities by identifying the fitness components you are trying to improve.

3 Which muscle?

Use the Which muscle? interactivity in your Resources section to identify the muscles that are involved in each of the different types of exercises.

4 My circuit

1. Design a practical circuit training program for a sport or activity of your choice.

2. Trial your circuit.

3. At the end of the session, record your performance in the circuit and how you felt when you had finished. Use the My circuit worksheet in your Resources section to help you.

4. Justify your choice of physical activities.

5 Sprint training program

1. The sprint training program below has been designed for a cricket batter running between the wickets. Fill in the blanks with appropriate values.
<table>
<thead>
<tr>
<th>Work time</th>
<th>Intensity</th>
<th>Reps</th>
<th>Sets</th>
<th>Rest period</th>
<th>Work to rest ratio</th>
<th>Frequency per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 seconds</td>
<td>95% MHR</td>
<td>3</td>
<td></td>
<td>1 : 5</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

2. Suggest how tweaking some of the values in the table would change the energy system being trained.

6 My family circuit

Create a fitness circuit for your family, using equipment found at your house, such as chairs, steps, garden beds and cans. Record a clip of your family completing the circuit. Show and discuss the family circuit clip within your class. Justify your choice of physical activities by identifying the component of fitness you are trying to improve.

CHECK & CHALLENGE

Explain

1. For each of the following training methods, give an example of how the principle of progressive overload could be applied.
   a. Circuit training program
   b. Interval training program
   c. Continuous training program

2. Explain three ways in which endurance training differs from strength training.

3. Give examples of the training methods used in both endurance training and strength training.

Elaborate

4. Why should plyometric training be carried out only under supervision?

Review

What have I learned?

- Health and fitness are your most valuable personal assets, and they have a large influence on your quality of life.
• Physical fitness may be defined as the ability to complete all that you need and desire to complete in a day without becoming exhausted, and still have enough energy left to cope with emergencies.

• The National Physical Activity Guidelines recognise the importance of physical activity for good health. Guidelines differ for children, adults and older adults.

• The ‘stages of change model’ best describes how people can be encouraged to change their attitude to participation in physical activity.

• Physical fitness includes both the health-related fitness components of aerobic power, muscular strength and power, local muscular endurance, flexibility and body composition, and the skill-related fitness components of speed, agility, balance, coordination and reaction time.

• Improved physical fitness levels are beneficial in many ways; most notably, they reduce the risk of developing cardiovascular disease, and promote a positive self-concept and self-esteem.

• There are a wide range of fitness tests available to assess each of the components of fitness, and to help you determine your current state of fitness or fitness profile and using the correct training principles and methods.

• Physical fitness can be improved through developing and applying an appropriate training program.

• In designing a training program, the key principles of specificity, progressive overload, frequency, intensity and time must be properly considered and incorporated.

• Appropriate warm-up and cool-down routines, and exercise techniques, are essential for a training program.

• There are many myths and fallacies related to fitness and training, including ideas about appetite, diet, changes to body shape and size, and the cost of exercise.

• The social–ecological model enables greater understanding of factors that act as barriers or enable participation in physical activity.

CHECK
1. Explain why your health and fitness are valuable.
2. List and explain the benefits of a regular physical activity program.
3. Outline the subjective and objective methods that can be used to assess physical activity.
4. Using the stages of change model, outline strategies to improve self-efficacy and move from the precontemplation stage through to the preparation stage.
5. List suitable fitness tests for health-related fitness components and skill-related fitness components.
6. To gain the greatest benefits from a fitness training program, we must correctly apply the key principles of training. Explain what this means.

7. How would you design a weight-training program that focuses on muscular endurance?

8. Using the social-ecological model, outline strategies that would reduce the barriers to physical activity.

9. Define the key words and terms of the topic using the In my words worksheet in your Resources section.

ESSENTIAL QUESTION REVIEWED

Why is it important for all individuals to be involved in regular physical activity, and how can this contribute to health and wellbeing at different stages of their lives?

Evaluate your initial response to the essential question now that you have studied the topic.
ICT activities

Training programs
SEARCHLIGHT ID: pro-0065

Scenario
You are a personal trainer and have been approached by a number of different clients. These individuals wish to have a program developed for their specific requirements. You need to encourage the individuals to follow the training program you will devise to enable the greatest improvement.

Your task
Develop a training program for each individual. The training programs must follow the training principles of frequency, intensity, duration, specificity and progressive overload. It is important that you develop a specific training program for each individual for maximum benefit.

• Individual A wants a program developed to improve her aerobic endurance.
• Individual B wants a program developed to improve his upper body strength.
• Individual C wants a program developed to improve his speed on the hockey field.
Process

- Open the ProjectsPLUS application for this chapter in your Resources section. Watch the introductory video lesson, click the ‘Start Project’ button and then set up your project group. You can complete this project individually or invite other members of your class to form a group. Save your settings and the project will be launched.

- Navigate to your Research Forum. Topics have been pre-loaded for developing training programs. These topics include training principles (frequency, intensity, duration, specificity and progressive overload) and training methods (continuous training, resistance training, plyometrics training, circuit training, interval training and aerobic training).

- Research. Make notes of interesting facts and intriguing ideas that you discover. Enter your findings as articles under your topics in the Research Forum. You should each find at least three sources (other than the textbook and at least one offline source, such as a book, encyclopaedia or magazine) to help you research the development of a training program. You can view and comment on other group members’ articles and rate the information they have entered. When your research is complete, print your Research Report to hand in to your teacher.

- Use the training program template to design different training programs for each individual.
<table>
<thead>
<tr>
<th>Exercise Type</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal exercises</td>
<td>eles-0779</td>
<td>An eLesson demonstrating sit-ups and floor cycling</td>
</tr>
<tr>
<td>Biceps brachii exercises</td>
<td>eles-0771</td>
<td>An eLesson demonstrating arm curls</td>
</tr>
<tr>
<td>Calf exercises</td>
<td>eles-0783</td>
<td>An eLesson demonstrating calf raises and stair running</td>
</tr>
<tr>
<td>Deltoid exercises</td>
<td>eles-0773</td>
<td>An eLesson demonstrating dumbbell presses, lateral raises and lying front raises</td>
</tr>
<tr>
<td>Gluteus maximus exercises</td>
<td>eles-0780</td>
<td>An eLesson demonstrating kneeling knee and leg lifts, as well as step-ups</td>
</tr>
<tr>
<td>Hamstring exercises</td>
<td>eles-0782</td>
<td>An eLesson demonstrating leg curls</td>
</tr>
<tr>
<td>Inner and outer thigh exercises</td>
<td>eles-0778</td>
<td>An eLesson demonstrating standing side leg lifts, and lying leg crosses and raises</td>
</tr>
<tr>
<td>Latissimus dorsi exercises</td>
<td>eles-0775</td>
<td>An eLesson demonstrating dips and rowing</td>
</tr>
<tr>
<td>Lower back and waist exercises</td>
<td>eles-0777</td>
<td>An eLesson demonstrating side bends with a lunge, seated trunk twists and seated toe-touches</td>
</tr>
<tr>
<td>Pectoralis major exercises</td>
<td>eles-0774</td>
<td>An eLesson demonstrating bench presses, wide push-ups, dumbbell flies and bent arm pullovers</td>
</tr>
<tr>
<td>Quadriceps exercises</td>
<td>eles-0781</td>
<td>An eLesson demonstrating leg extensions, quarter squats, vertical jumps and step-ups</td>
</tr>
<tr>
<td>Rhomboid exercises</td>
<td>eles-0776</td>
<td>An eLesson demonstrating front-lying and bent-over rowing</td>
</tr>
</tbody>
</table>
### Trapezius exercises

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Lesson Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>An eLesson demonstrating the military press and shoulder shrug</td>
<td>eles-0772</td>
<td></td>
</tr>
</tbody>
</table>

### Triceps brachii exercises

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Lesson Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>An eLesson demonstrating dips, push-ups, french curls and tricep kickbacks</td>
<td>eles-0770</td>
<td></td>
</tr>
</tbody>
</table>

### SUGGESTED SOFTWARE

- ProjectsPLUS
- Microsoft Word
- Microsoft PowerPoint
- Adobe Photoshop
- Microsoft Publisher

### MEDIA CENTRE

Your Media Centre contains:

- an interview with netball player Tegan Caldwell, in which she discusses her netball training
- a bank of images of people exercising
- an assessment rubric.