

3

Physical fitness

OUTCOMES

In this chapter a student:

- 1.1** discusses factors that limit and enhance the capacity to move and perform
- 1.2** analyses the benefits of participation and performance in physical activity and sport
- 4.1** works collaboratively with others to enhance participation, enjoyment and performance
- 4.2** displays management and planning skills to achieve personal and group goals
- 4.3** performs movement skills with increasing proficiency
- 4.4** analyses and appraises information, opinions and observations to inform physical activity and sport decisions



STARTING POINT

Physical fitness is an important aspect of a healthy lifestyle. There are different types of physical fitness, that can contribute to performance and overall health through appropriate training. This chapter discusses ways of developing and measuring physical fitness.

Physical fitness

Physical fitness is the ability to perform moderate to vigorous physical activity on a regular basis. This level of fitness requires an understanding of the different components of physical fitness and an awareness of the relationship between training and performance.

Definitions of physical fitness

Physical fitness refers to **health-related** and **skill-related components** of fitness, which impact on the ability to perform physical activity on a regular basis. Health-related physical fitness describes the components of fitness that keep you healthy, including cardiovascular fitness, strength, muscular endurance, flexibility and body composition. Skill-related physical fitness describes the components of fitness that require certain skills like agility, balance, coordination, power, reaction time and speed.

Health-related physical fitness

There are five components of health-related physical fitness:

- **Cardiovascular fitness** is sometimes referred to as aerobic fitness and is the ability of the heart, lungs and blood vessels to supply oxygen to the muscles during prolonged physical activity of moderate to vigorous intensity.
- **Strength** is the maximum amount of force a muscle or muscle group can produce in a short period of time.
- **Muscular endurance** is the ability to exert force several times while resisting fatigue.
- **Flexibility** is the ability to move a joint through its complete range of movement and the degree of flexibility is specific to each joint.
- **Body composition** is a measure of the proportionate relationship of body tissues, including muscle, bone and fat. In terms of fitness, it refers to the percentage of body weight that is made up of body fat.

Skill-related physical fitness

There are six components of skill-related physical fitness:

- **Agility** is the ability to change the direction of the body or body parts quickly and with control.
- **Balance** is the ability to keep the body upright or in position while static or moving.
- **Coordination** is the ability to move different parts of the body together at the same time.
- **Power** is the ability to use strength with speed, or the maximum force exerted in the shortest time possible.
- **Reaction time** is the amount of time it takes to respond to stimulus.
- **Speed** is the ability to perform movement quickly.

The benefits of physical fitness

In chapter 2 we discussed the many benefits of regular physical activity on health and wellbeing. The benefits of physical fitness include the same physical, mental and social benefits listed in chapter 2, plus some more specific potential benefits depending of the type of physical fitness training.

The benefits of physical fitness can include:

- improved cardiovascular endurance
- increased strength
- increased flexibility
- improved muscular endurance
- decreased body fat
- increased lean muscle mass
- increased power
- increased balance
- improved agility
- increased speed
- improved coordination
- improved reaction time.

The benefits received from physical fitness will vary from person to person depending on the type and level of training in which they are involved.

Figure 3.1

Yoga improves many components of fitness, including strength, flexibility and balance



Learning experience

Think about the types of physical activity you participate in and list the four you most enjoy. How do these physical activities assist in developing physical fitness?

Copy the table below into your workbook and assess how the activities you enjoy doing may develop the health-related and skill-related components of physical fitness. Place a cross next to any components of fitness your activity may improve and then answer the questions that follow. >>

Components of fitness	Example: Yoga	Activity 1: _____	Activity 2: _____	Activity 3: _____	Activity 4: _____
Cardiovascular fitness					
Strength	X				
Muscular endurance	X				
Flexibility	X				
Body composition	X				
Agility					
Balance	X				
Coordination	X				
Power					
Reaction time					
Speed					

- 1 Which activity improved the most components of fitness?
- 2 Were the health-related or skill-related components of fitness most commonly improved?
- 3 Which components of fitness are not being developed in the physical activities you enjoy?
- 4 What activities could you participate in to develop these missing components of fitness?

The contribution of physical fitness to participation and performance

A person's level of fitness can contribute to their participation in physical activity and their performance in sport. A person with a higher level of fitness may be more willing and able to participate in a variety of physical activities due to increased confidence, fitness, ability and skill level. A person with a high level of physical fitness is more likely to perform well in physical activities or sports due to their resistance to fatigue and heightened health-related and skill-related components of fitness. However, it is important to remember that physical fitness can be very specific and someone who trains hard for a specific sport and performs well in that sport may not perform as well in a sport they have not trained for. For example, a runner may train daily and perform well in long-distance running but not be able to swim more than a few laps in the pool because they do not have the specific strength and fitness for swimming.



Learning experience

Activities:

- weight training
 - touch football
 - swimming
 - basketball
 - long jump
 - folk dancing
 - surfing
 - horse riding
 - soccer
 - 100-metre sprint running
- 1 Participate in four of the activities listed opposite (or others allocated by your teacher).
 - 2 In small groups, analyse the activities in which you participated in terms of the components of fitness.
 - 3 List the components of fitness in order of priority for each activity.
 - 4 Explain how each activity requires each component of fitness and explain how physical fitness enhances the performance of each activity.
 - 5 Justify how physical fitness enhances the safety of each activity.
 - 6 Choose one of the activities analysed and design a poster displaying the elements of fitness required for the activity. Present your chosen activity and poster to the class.

Physical activity versus physical fitness

Physical activity is a term used to describe any movement made by the body that uses energy. It includes everyday incidental movement like cleaning your room, walking to the bus and climbing the stairs instead of taking the lift. Physical activity also includes exercise for the purpose of improving and maintaining physical fitness. Physical fitness is the ability to perform moderate to vigorous physical activity on a regular basis.

Current research and initiatives

Research over the past few years has shown that only about half of the Australian population achieve the minimum level of physical activity recommended in the National Physical Activity Guidelines for Australians. Research has also shown that Australia is now one of the fattest developed nations in the world, with obesity rates doubling over the past few decades. In response to this, the focus of health promotion for young people has shifted from physical fitness to physical activity.

As it is now becoming increasingly accepted that regular vigorous physical activity has many benefits for health and wellbeing, there have been many government initiatives developed to encourage the improvement of Australians' health. Some examples of these initiatives in Australia in recent years are outlined below.

The Healthy Active Ambassadors Program

The Healthy Active Ambassadors Program targets young Australians and aims to raise awareness of the importance of healthy living and particularly maintaining healthy body weight. The ambassadors include well-known healthy, active people like Harry Kewell, Brett Lee, Hi-5, Brooke Hanson and Layne Beachley.

Healthy Weight website

The Healthy Weight website offers free information on many aspects of being healthy and maintaining a healthy weight. This includes information on factors that can affect your weight; nutrition and eating a healthy, balanced diet; recommendations for physical activity to maintain health; and tools and tips for eating well and being active. It also has a **body mass index (BMI)** calculator to help measure your healthy weight.

National Children's Nutrition and Physical Activity Survey

This survey, conducted in 2007, called Kids Eat Kids Play was designed to provide information about the dietary intake and body size and weight of children aged 2 to 16 years, and activity patterns of children aged 5 to 16 years. The information gathered from this survey can influence how governments and other organisations promote good nutrition and healthy lifestyles in Australia.

Around Australia in 40 Days Challenge

This initiative was an interactive walking challenge for high school students. Participants wore pedometers and the aim was for teams of students to take enough steps to effectively 'walk around Australia' in 40 days or less. The use of pedometers encouraged students to walk more steps each day and therefore increase physical activity.

Building a healthy, active Australia

As part of the conditions of funding under the Australian Government's school funding legislation for 2005–08, it was suggested that each state and territory government and non-government education authority be required

to include in their curriculum at least 2 hours of physical activity each school week for primary and junior secondary school children. This initiative is known as the Active School Curriculum. The funding also includes an initiative called Active After-School Communities. This program provides Australian families with a convenient and practical opportunity to support the healthy development of their primary-school-aged children through after-school physical activity programs.

Get Moving

The Get Moving campaign targets children and adolescents, as well as parents, to communicate the need for greater levels of physical activity among young people. The Get Moving website includes quizzes, information, television commercials and fun ideas for physical activity.

Webconnect

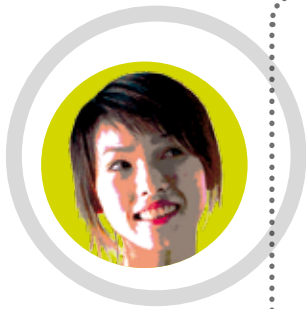
See the tips for healthy living at: <www.walkingchallenge.gov.au>.

Learn about the Healthy Active Ambassadors Program at:
<www.healthyactive.gov.au>.

Take a look at the Healthy Weight website at:
<www.healthyactive.gov.au>.

See the official Kids Eat Kids Play website at: <www.kidseatkidsplay.com.au>.

Check your knowledge with a quiz on the Get Moving campaign website at:
<www.healthyactive.gov.au/getmoving>.



Learning experience

In small groups, design your own initiative or campaign to improve the health and wellbeing of young Australians. Present your initiative to the class using posters, pamphlets, role-plays and demonstrations.

Developing physical fitness

Unlike physical activity, which can be of any intensity, physical fitness requires regular moderate to vigorous training to develop each of the health-related and skill-related components.

FITT principle

The **FITT principle** is a guideline for physical fitness training. The elements of the FITT principle are outlined on the next page.

- **Frequency**—how often you do physical activity or the number of exercise sessions you complete each week. Frequency depends on your training goals; for example, strength fitness training may only require two to three training sessions a week, while cardiovascular fitness training requires three to five sessions per week.
- **Intensity**—how hard you perform physical activity. It refers to the level of effort exerted during exercise—low, moderate or vigorous—and is dependent on the type of fitness training. For example, intensity can be determined by measuring heart rate for cardiovascular fitness, or the amount of weight lifted for strength training.
- **Time**—the duration of each exercise session. To build cardiovascular fitness, each session time should be a minimum of 20 minutes of continuous activity.
- **Type**—the kind of activity or nature of the exercise performed. Different types of activity will develop different components of physical fitness. For example, running will improve cardiovascular fitness but will not improve flexibility unless you incorporate flexibility training like **stretching**.

The FITT principle for cardiovascular fitness training and strength fitness training is summarised in table 3.1.

Table 3.1

The FITT principle for cardiovascular and strength fitness training

FITT	Cardiovascular	Strength
Frequency	3–5 times a week	2–3 times a week (per body part)
Intensity	Moderate to vigorous 60–80% maximum heart rate (MHR)	3 sets of 10–15 repetitions
Time	20–60 minutes	30–45 minutes
Type	Cardiovascular activity	Compound (working many muscle groups) or isolated (working one muscle group)

Learning experience

Explain how can you apply the FITT principle to make a difference to your own cardiovascular fitness and strength.

F Frequency
I Intensity
T Time
T Type



Designing training programs

There are many factors to consider when designing training programs, including various **training principles** and different **types of training**.

Training principles

There are six principles of training that should be considered when developing training programs. These include warm-ups and cool-downs, progressive overload, specificity, reversibility, variety, and training thresholds.

- **Warm-ups and cool-downs** should always be included at the beginning and end of a training session. The warm-up allows the athlete to be physically and mentally prepared for their training session. It gets the blood moving around the body; warms the body, which increases the elasticity of the muscles, ligaments and tendons; increases the heart rate; and decreases the risk of injury to the body. The cool-down slows the heart rate; cools the body; brings the blood back to the heart rather than pooling in the muscles; and again, decreases the risk of injury to the body. It is important to include stretching in the warm-up and cool-down as this reduces muscle soreness and aids in recovery of the muscles.

Figure 3.3

Stretching is an important part of every training session, particularly in the cool-down



- **Progressive overload** is used to improve performance and training benefits. The body needs to be continually loaded beyond its normal levels; for example, running for more time or lifting heavier weights. As the body adapts to the new load, the training program must be adjusted to progressively provide more load.
- **Specificity** in training programs is important to the exact demands of the designated sport and to the individual needs of the athlete. For example, a swimmer needs to spend most of their training in the pool.
- **Reversibility** can occur when training stops or decreases, and results in a loss of fitness benefits. For example, if an athlete stops strength training they will lose strength, and if an athlete excludes stretching they will lose flexibility.
- **Variety** is important in training programs to avoid boredom and to maintain motivation.
- **Training thresholds** must be appropriate to an athlete's designated sport. Training thresholds refer to the amount of exercise required to improve fitness in either the aerobic or anaerobic energy systems (these systems were explained in detail in chapter 1).

Types of training

There are three main types of training, including aerobic training, strength training and flexibility training.

- **Aerobic training** increases the efficiency of the aerobic energy system and improves cardiovascular fitness. It also reduces the risk of heart disease and helps to control body weight. During aerobic training the heart rate must be increased and continuously remain at a suitable working heart rate for at least 20 minutes. Types of aerobic training include continuous training, fartlek training, interval training, circuit training and aerobics.
- **Strength training** increases the body's strength, power and muscular endurance through contracting the muscles during training. Types of muscle contraction used in training include isometric contractions, isotonic contractions, isokinetic contractions, eccentric contractions and concentric contractions.
- **Flexibility training** improves the movement allowed by the joints of the body by lengthening and increasing the elasticity of the muscles around the joints. Flexibility reduces the risk of injury and decreases muscle soreness and stiffness. Types of flexibility training include static stretching, ballistic stretching and proprioceptive neuromuscular facilitation (PNF) stretching.

Linking programs to specific components of fitness

Training programs need to develop components of physical fitness relevant to a specific context. It is important to understand that different sports require different components of fitness. Training programs need to be specific to a sport to ensure that the appropriate fitness components are being enhanced. Cardiovascular activities, such as long-distance swimming or running, mostly require cardiovascular fitness and muscular endurance. While flexibility and strength training may also assist long-distance swimmers or runners, their main focus in training would be cardiovascular fitness and muscular endurance because these are the fitness components they most need for performance. Similarly, a gymnast would focus on balance and flexibility training more than speed, because their performance requires these specific components of fitness. Not being specific in training can be detrimental to performance.

Learning experience

- 1 Find definitions for the following terms related to each type of training. Include an example for each definition.

Aerobic training

- Continuous training
- Fartlek training
- Interval training
- Circuit training
- Aerobics

Strength training

- Isometric contractions
- Isotonic contractions
- Isokinetic contractions
- Eccentric contractions
- Concentric contractions

Flexibility training

- Static stretching
- Ballistic stretching
- PNF stretching

- 2 Copy the table on the next page into your workbook. Identify the specific energy systems, components of fitness, training principles and types of training for the sports listed.



Activity	Energy system	Fitness components	Training principles	Types of training
Example 1500 metre swim	Aerobic	Cardiovascular fitness Muscular endurance Flexibility	Variety Training threshold	Aerobic Strength Flexibility
Soccer				
Long jump				
Marathon run				
100 metre sprint run				
Rugby league				
Snowboarding				
Classical ballet				
Surfing				
Netball				

Safety and injury prevention

There are factors to be considered when designing and implementing physical fitness programs for young people to ensure safety and injury prevention.

Before beginning any training program, the first step is pre-activity screening. Pre-activity screening is the process of collecting health-related information, including personal information, medical conditions, family history and exercise history. It is very important to complete a pre-activity screen before **fitness testing** or training to avoid injury or an unforeseen problem, and to collect information that may be useful for the basis of the physical fitness program.

Figure 3.4

Pre-activity screening is important before beginning a training program



As discussed in principles of training, it is important to include a warm-up and cool-down in every training session to prepare the body and reduce the risk of injury and muscle soreness.

There are specific safety factors for young people in relation to strength training. Pre-pubescent adolescents should not lift heavy weights, as this can cause permanent damage and impact on their growth. Young people should focus on correct strength training techniques using light weights or their own body weight.

Some other general safety factors include ensuring sun safety, staying well-hydrated, wearing protective clothing and using equipment such as helmets or shin guards, ensuring that the equipment being used is safe, and staying mentally alert during practice.

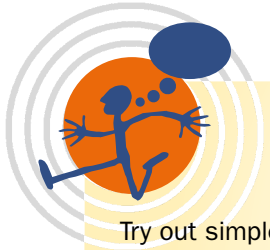
Recognising myths and fallacies

Many products and strategies are promoted as being rapid and effective in the development of physical fitness, increasing strength or losing weight. It is important to remember that no matter what advertisers promote, there is no quick fix. You do not need to buy special machinery, equipment or pills and potions to be fit and healthy. Physical fitness requires regular training and application of the principles we have discussed. Although many people claim they cannot afford to exercise or go to the gym, physical fitness does not need to be costly. There are many exercises you can do with minimal equipment and space.

Figure 3.5

Exercise for free by using stairs for step-ups, a bench for triceps dips, a skipping rope, a playground for chin-ups or just walk in the great outdoors





Learning experience

Try out simple ways to be active at home by developing a physical fitness routine using readily available equipment, such as a fitness ball, skipping rope, stairs, hand weights (or tin cans and bottles), and an exercise mat or towel.

In small groups develop a five-station circuit with the equipment available in your class.

Ensure the overall circuit exercises different parts of the body and works on different components of fitness. Include strategies for safety and injury prevention. The groups will present their exercises and the whole class will participate in each circuit.

Measurement and evaluation

Measurement and evaluation in physical fitness is important in developing training programs and improving performance. Measurement and evaluation allows for an understanding of progress and highlights any weaknesses that need to be improved for performance. Measurement and evaluation can also be used to monitor general health and wellbeing.

Purpose of physical fitness measurement

The purpose of physical fitness measurement is to assess a person's capacity to perform physical activity. In the school context, physical fitness measurement can be used to assess student achievement (although this is not recommended); to evaluate the effectiveness of school fitness programs; and as a strategy for learning about fitness concepts. Other reasons for measuring fitness include educating individuals about their current fitness status, using the results to develop exercise and training programs, providing data for future evaluation of training programs and to motivate individuals to achieve specific health and fitness goals.

Usually physical fitness measurement, or fitness testing as it is commonly referred to, refers to the health-related components of physical fitness (cardiovascular fitness, strength, muscular endurance, flexibility and body composition), as these are seen to be more essential to long-term health. However, there are also measurements for the skill-related components of fitness.

Measurement protocols

Fitness testing must be conducted in a safe environment with trained assessors. Instructions must be clear to ensure safety and confidentiality of results should be assured. It is important to reduce comparison and avoid potential embarrassment, and to focus on educating the individual about personal health and fitness and setting personal fitness goals.

Fitness tests should be both valid and reliable. Validity is the degree to which a fitness test measures what it is intended to measure. Reliability is the degree to which repeated tests give the same results. To ensure validity and

reliability it is important to use validated tests with consistent test conditions in a consistent test environment. It is important to remember that different parts of the body can have varying degrees of fitness; for example, you may be flexible in your hamstrings but not your shoulders, or you may have a lot of lower-body strength but not upper-body strength. Therefore fitness tests can give an indication of the components of physical fitness but they are specific to the body part or muscle group being tested.

Health-related fitness tests

The common fitness tests used to measure health-related components of physical fitness include the following.

- **Cardiovascular fitness** can be measured with the multi-stage fitness test and the 1.6 kilometre run. The results from these tests can be compared to standardised averages according to age and sex, and are ranked as excellent, good, average, below average or poor.
- **Strength** can be measured by the grip test, which uses a dynamometer gripped by the hand. Results can be compared to averages for males and females.
- **Muscular endurance** is commonly measured by push-ups on a chair or curl-ups. Push-up results can be compared to averages by sex and curl-up results can be compared to averages by sex and age.
- **Flexibility** is measured with the sit and reach test, and results can be compared to sex and age averages.
- **Body composition** can be measured with skinfold tests; however, results can be inaccurate if the assessor is not highly experienced. Calculating BMI is a simple method of indicating healthy body weight.

Skill-related fitness tests

The common fitness tests used to measure skill-related components of physical fitness include the following.

- **Agility** can be measured by a shuttle run test, where the person being tested has to change directions quickly. The test is measured with time and averages compared for males and females.
- **Balance** is measured by the stork stand, where you are timed standing on one leg. Test results can be compared to average time in seconds.
- **Coordination** can be measured with the hand wall toss. The person being tested throws a tennis ball at a wall with their right hand and then catches it with their left hand. They then repeat this using opposite hands. The total number of catches in 30 seconds is recorded and can be compared to averages for males and females.

Figure 3.6

Body composition can be measured by skin-fold tests



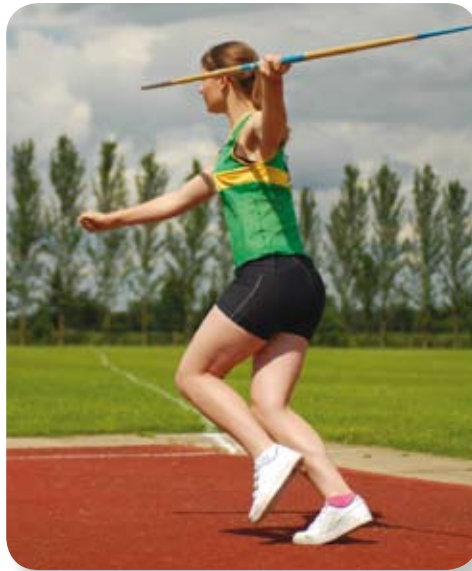
- **Power** is commonly measured by the standing long jump or vertical jump tests. Both of these tests measure leg power. Results are measured in centimetres and can be compared to averages for males and females.
- **Reaction time** can be tested with the ruler test. The ruler test involves the tester holding a ruler between the outstretched thumb and forefinger of the person being tested, with the thumb initially lined up at the zero point on the ruler. The ruler is then dropped and wherever it is caught is measured in centimeters and can be compared to standard averages.
- **Speed** can be measured by running a 50-metre sprint, which is recorded in seconds and can be compared to norms for age and gender.

HotSpot



In pairs, research how fitness measurements and evaluations are used in a particular context, such as in injury rehabilitation or team selection. Present your findings in a written report and prepare an oral presentation summarising the main findings of your report.

Figure 3.7
Fitness testing could help you set goals for specific sports



Interpreting and processing results

Once you understand the nature of fitness testing and the types of tests for health-related and skill-related fitness, it is also very important to be able to interpret and process results so that you can make recommendations and design strategies to improve each component of fitness.



Learning experience

- 1 Participate in the health-related and skill-related fitness tests described earlier, depending on the availability of the testing equipment at your school.
- 2 Measure your health-related and skill-related physical fitness levels and record your results so that you can compare them to the next time you test your fitness.
- 3 Compare your results to the standard norms given with each test and record your ranking (excellent, good, average, below average, poor).
- 4 Design strategies to achieve specific fitness goals relevant to your personal fitness results.

Positive and negative outcomes

Fitness testing may generate different reactions from different people. Some people feel fitness testing has positive outcomes, as it allows them to keep track of their fitness over time and set specific goals to improve their fitness, and encourages them to be physically active. Others find that fitness testing has negative outcomes, as it makes them feel unfit or embarrassed at being compared to their peers. It may discourage them from participating in physical activity. To combat these negative outcomes, fitness testing should not be used as an assessment tool of achievement in class and fitness test results should be private to each individual. Test results should be compared only to standardised test averages and not to others in the class. Measuring height and weight in class can also be a sensitive issue throughout puberty while the body is growing and changing, and this personal information should not be compared with that of others. The aims of fitness testing should be to educate individuals and to encourage participation in physical activity.



Learning experience (ICT)

Investigate the positive and negative effects of fitness measurements on participation in physical activity and sport by gathering the views of young people. Survey five high school students, asking the following questions.

- 1 What experience have you had with fitness testing?
- 2 How did it make you feel?
- 3 What are the positive aspects of fitness testing for young people?
- 4 What are the negative aspects of fitness testing for young people?
- 5 How does fitness testing affect young people's participation in physical activity and sport?

Collate the gathered information into an Excel spreadsheet and present your results to the class.

Chapter cloze

The ability to perform physical activity on a regular basis is known as _____ and includes _____-related and _____-related components. When designing training programs, there are six _____ and three _____ to consider. It is also useful to use the _____ principle as a general rule for training. It is important to include _____ in training sessions to avoid injury. The assessment of a person's capacity to perform physical activity is known as _____. A formula to calculate healthy body weight is _____.

BMI
fitness testing
FITT
health
physical fitness
skill
stretching
training principles
types of training

Review questions

- 1 What are the health-related components of physical fitness?
- 2 What are the skill-related components of physical fitness?
- 3 Describe the FITT principle.
- 4 Define and explain the six principles of training.
- 5 Analyse the positive and negative outcomes of school physical fitness testing.