INQUIRY QUESTION
Are these typical Australians, engaging in plenty of sport and recreation?
Many people are well aware of the benefits of increasing physical activity and decreasing sedentary behaviour; however, the message doesn’t seem to be sinking in. Recent statistics reveal an alarming increase in health problems due to inactivity and unhealthy lifestyles. There are many barriers to people engaging in physical activity, ranging from geographical location and access to facilities, age, gender, socioeconomic status to cultural influences. The key is for our government to provide more enablers to physical activity and raise awareness of the importance of being physically active so that the health of our nation can improve.

**KEY KNOWLEDGE**
- Prevalence and trends of physical activity, sport and sedentary behaviour in the population
- Physical, social, mental and emotional benefits of regular participation in physical activity
- The increased health risks associated with being physically inactive, including type 2 diabetes and obesity
- Physical activity and sedentary behaviour guidelines for different age groups and population groups
- Subjective and objective methods of assessing physical activity and sedentary behaviour, such as recall surveys or diaries, pedometry, accelerometry, inclinometry, observation tools (including digital tools such as smart phone and tablet apps) and personal activity trackers

**KEY SKILLS**
- Participate in physical activity, and collect, analyse and reflect on information related to the physical, social, mental and emotional health benefits of physical activity
- Explain the health consequences of physical inactivity and sedentary behaviour
- Describe the physical activity and sedentary behaviour guidelines for different stages across the lifespan
- Use appropriate methods to measure and analyse physical activity and sedentary behaviour levels at the individual and population levels
- Collect, analyse and interpret primary and secondary data related to trends in participation in physical activity

**CHAPTER PREVIEW**
Australia: a healthy nation?

**KEY CONCEPT** High levels of physical activity and low levels of sedentary behaviour positively influence the health of individuals.

Australians like to think of themselves as a healthy and active nation of people. In many respects Australia excels in the health and wellbeing of its population; however, there are alarming trends indicating that many people are engaging in less physical activity and being inactive for longer periods of time. This unhealthy combination increases the risk of ill health, with clear links to conditions such as cardiovascular disease, osteoporosis, obesity and diabetes mellitus type 2.

In addition, there is growing awareness of the link between physical activity and the promotion of mental and social health. Being active improves one’s mood and reduces the impact of conditions such as anxiety, stress and depression. Not only does physical activity improve quality of life but it can also increase life expectancy. Due to the significant impact that inactivity can have on a community, it makes sense that stakeholders in health promotion have an accurate understanding of the physical activity and inactivity levels of the population.

**FIGURE 11.1** There are clear links between physical activity and health.

**Benefits of being physically active**

There is a growing awareness in the community about the positive effects that movement has on the health of individuals and populations. This extends beyond the physical health benefits of being physically active to include social, mental and emotional health.
Physical activity can be defined as any form of movement that expends energy. This includes incidental activity that occurs throughout the day, such as chores around the home, moving from one classroom to another at school or getting up out of bed and having a shower. In addition to incidental activity, people expend energy via other activities such as gardening, playing sport, active transport and involvement in other recreational activities.

**Benefits of regular physical activity on physical health**

Physical activity, like the other dimensions of health, can benefit from regular physical activity. Physical health is not just the absence of illness or disease but takes into consideration the efficient functioning of the body. This includes the capacity of a person to undertake desired activities on a daily basis without undue stress or fatigue occurring. From a physical perspective, engaging in regular activity has multiple benefits for the human body.

These benefits include **weight management**, building and maintaining healthy bones, muscles and joints and a reduction in the risk of suffering from chronic and life-threatening conditions such as diabetes mellitus, obesity, cardiovascular disease, osteoporosis, hypertension and some cancers.
The risks of not being physically active

Chronic health conditions have a significant impact on the community. Not only are there implications for physical health at both an individual and population level, but there are also negative impacts on the social, emotional and economic health of the nation.

Diabetes

Type 2 diabetes is a growing health concern in many countries, including Australia, with close to a million adults diagnosed with the condition. It is a disease characterised by the inability of the pancreas to properly control blood sugar levels in the body. It usually develops in people over the age of 45, but due to poor lifestyle habits there are increasing numbers of younger people and children at risk of developing type 2 diabetes. To combat the increasing prevalence of this condition within the Australian community there are lifestyle choices that people can make, including eating more nutritious foods, reducing kilojoule intake and engaging in more physical activity.

The other two types of diabetes are gestational diabetes, which develops during pregnancy, and type 1 diabetes. Type 1 diabetes is an autoimmune condition that may be genetic, but has no known cause and is not linked to lifestyle factors. Mainly children and adolescents are diagnosed with type 1 diabetes, and it has nothing to do with weight, diet or exercise, although in order to manage the disease, these factors become important.

Obesity

Weight management is an important aspect of maintaining a healthy weight. There needs to be an appropriate balance between the energy expended per day compared to the energy taken in via food and drink. If there is a balance between energy in and out, then a person will maintain a stable body weight. If there is an imbalance, then weight can be lost or gained. For many Australians weight gain occurs because energy intake via food and drinks is higher than the energy expended by the body. In fact, more than two out of three Australian adults are overweight or obese.

What determines energy expended? It is a combination of the energy expended by the body during normal rest periods in addition to any movement. The quantity of energy used while moving depends on, in particular, the duration and intensity of activity. For example, walking for 40 minutes instead of 15 minutes will expend far more energy, as would running at 12 kilometres per hour instead of at 8 kilometres per hour.

**FIGURE 11.4** Obesity is a condition where excess fat is carried by an individual due to an imbalance between energy intake and energy expenditure.
Cardiovascular disease

A leading cause of death in Australia is cardiovascular disease. This is a collective term that covers diseases of the cardiac muscle (heart) and the vessels that transport blood around the body.

**TABLE 11.1 Two common examples of cardiovascular disease**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary heart disease</td>
<td>This is the most common form of heart disease in Australia and kills more Australians per annum than any other single cause. The coronary artery becomes blocked and prevents blood being pumped back to the heart. When not enough blood is delivered to the heart muscle, temporary chest pain, known as angina, occurs. Angina is associated with an increased risk of a myocardial infarction, the technical term for a ‘heart attack’.</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>The second most predominant cause of death in Australia includes blockages and bleeding within the brain, often referred to as ‘strokes’.</td>
</tr>
</tbody>
</table>

There are many risk factors for cardiovascular disease, some controllable and some not. The uncontrollable factors include age, ethnicity and genetic influences (there is a strong family link). There is, however, a range of lifestyle choices that individuals can make to decrease the risk of cardiovascular disease, such as not using tobacco products and consuming a healthy diet, which is low in saturated fats. Physical inactivity is also a major risk factor for cardiovascular disease. By making healthy lifestyle choices, such as eating well and exercising, other risk factors for cardiovascular disease can be controlled, including hypertension (high blood pressure), obesity, diabetes mellitus and high blood cholesterol levels.

**Osteoporosis**

Osteoporosis is a condition suffered by many Australians. Older people are at most risk of suffering from osteoporosis. Data from the Australian Bureau of Statistics (ABS) indicates that over 650,000 Australians aged over 50 have been diagnosed with the condition, with women accounting for approximately 80 per cent of all cases.
Osteoporosis is characterised by a reduction in bone density. Healthy bone tissue is constantly being broken down and replaced, but for people with osteoporosis, this process of repair does not keep up with the deterioration of the bone tissue, causing bones to become weak and brittle. This thinning of the bones leads to a higher risk of bone fractures. There is a range of risk factors associated with osteoporosis, the most significant being the inadequate consumption of calcium, a lack of vitamin D absorption and physical inactivity.

To minimise the chances of suffering from osteoporosis, children and adolescents are strongly encouraged to develop the largest bone density possible by ensuring sufficient calcium intake through ingestion of foods which are calcium rich, such as dairy foods, and exposure to vitamin D from the sun. In addition, bones become strengthened when exposed to weight-bearing activities such as soccer, running and netball. High impact actions such as jumping (e.g. in gymnastics or dance) and jumping rope develop bone growth. Although non weight-bearing activities are beneficial for health, they do not promote bone density. This includes activities such as cycling and swimming, where there are no direct gravitational forces acting on the bones.

**Figure 11.6** Gymnastics incorporates weight-bearing activities that are great for strengthening bones and muscles.

**Cancer**

Cancer is a term to describe the abnormal growth and multiplication of the body’s cells. This can occur in any of the cells of the body but is most common in the skin, lungs, breasts, prostate and bowel. There are a range of causes of cancer including exposure to chemical, physical or biological factors. Exposure to excessive ultraviolet light and smoking are two significant risk factors for Australians. There is also a link between being overweight or obese and suffering from cancer of the breast, bowel and kidneys among other types.

Due to the link between excessive body weight and the risk of some cancers, physical inactivity is therefore a risk factor. By engaging in regular physical activity and limiting sedentary behaviour, body weight can be better maintained at a healthy level and therefore decrease the risk of cancer.
Benefits of regular physical activity on mental and emotional health

Although mental and emotional health are often linked, they are different. *Mental health* relates to the brain having the capacity to work well. This can also be referred to as having good cognitive functioning. A person with good mental health would display proper reasoning ability, have good memory, remain focused and be capable of acquiring new knowledge (i.e. be a good learner). *Emotional health*, on the other hand, relates to the capacity to appropriately display and control emotions. Being anxious or depressed would be signs of poor emotional health.

Being physically active has been shown to promote both mental and emotional health. There is evidence linking the following with physical exercise:

- improved mood and energy levels
- improved body image and self-esteem
- decreased anxiety
- decreased depression (exercise has been proven to be a potent antidepressant)
- increased mental clarity
- improved brain functioning, including improved attention and learning with significant benefits in middle aged and elderly people.

There is increasing evidence that shows participation in of physical activity can improve brain function and subsequent learning. Schools that have more regular Physical Education (PE) classes have proven academic gains over those schools with less PE time.
Benefits of regular physical activity on social health

There are strong links between being physically active and improved social health, particularly for people who use physical activity as a tool for engaging with others. Social health can be described as the capacity to get on well with others. It includes the ability to adapt to new people and environments, form healthy and satisfying relationships, appropriately deal with conflict and behave in a socially acceptable manner. Improved social health can occur via engagement in physical activity, either as a member of a sports team or club, exercising with others or even meeting people on walks. The positive effects of physical activity on social health include:

- improved communication skills
- decreased feeling of isolation and loneliness
- increased interactions and collaboration with others
- wider exposure to new people and places
- increased rapport and friendship with others
- increased empathy and trust for others.

The relationship between emotional, mental, social and physical health

Although it is easy to look at the different dimensions of health in isolation, they are interrelated and can affect each other in both positive and negative ways. A negative example is the impact of a broken leg on a player in a sports team. As a result of this decline in physical health, not playing sport may cause emotional disturbance, such as feelings of anxiety and moodiness. If poor mood causes conflict with others this may reduce the social health of the individual. If the individual spends time worrying about their situation, their mental health may be negatively affected, leading to decreased cognitive functioning.

A positive example of how the dimensions of health can have an impact each other would be a retired worker joining a golf club. The retiree would experience improved physical health from walking around the golf course. Walking around the course...
would also provide opportunities to promote social health via meeting new people. This would improve emotional health by making the retiree happier.

**Figure 11.10** Participation in recreational activities, such as golf, enables social benefits in addition to physical benefits.

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**TEST your understanding**

1. Outline the four dimensions of health discussed in this chapter.
2. Obesity is prevalent in the Australian population. Discuss the link between this condition and ill health.
3. Describe the difference between mental health and emotional health.
4. Make a list of the social benefits of being involved in a sports or recreational club.

**APPLY your understanding**

5. You overhear a family member saying that they don’t need to exercise to be healthy. Describe in detail the many benefits of being physically active.
6. An elderly neighbour has just been diagnosed with diabetes mellitus. The neighbour asks you for advice. What is diabetes mellitus? What are the lifestyle changes that can be made to reduce the symptoms or side effects of this condition?
7. The dimensions of health are interrelated. Use an example to explain what this means.
8. **Practical activity:** Participate in a class engaged in a recreational activity such as lawn bowls, bocce, archery or any other selected by the teacher. After participating in the class, outline the potential benefits across the physical, social, emotional and mental dimensions of health.
KEY CONCEPT: The Australian Physical Activity and Sedentary Behaviour Guidelines have been developed to provide health advice for the Australian population.

The Australian Physical Activity and Sedentary Behaviour Guidelines were developed by the Australian government and are advertised via many avenues, including the Department of Health website. This website provides a variety of resources to help people make informed decisions about their health. This includes specific recommendations for different population groups to promote physical activity and discourage inactivity. These recommendations are mapped to the following population groups:

- children from birth to 5 years of age
- children between the ages of 5 and 12
- young people between the ages of 13 and 17
- adults aged 18 to 64 years
- older adults aged 65 years old and above.

For each of these groups, the recommendations have been based on evidence that links the intensity, frequency, duration and type of physical activity to specific health outcomes, such as a reduction in obesity, cardiovascular disease, diabetes mellitus and other chronic diseases. Similar evidence has linked increased sedentary behaviour with these same conditions. Following the Australian Physical Activity and Sedentary Behaviour Guidelines is strongly correlated with significantly improved health outcomes. The Australian Physical Activity and Sedentary Behaviour Guidelines for each age group are listed in the following sections.

Physical Activity Recommendations for children aged 0–5

Physical activity recommendations

- For healthy development in infants (birth to 1 year) physical activity — particularly supervised floor-based play in safe environments — should be encouraged from birth.
- Toddlers (1–3 years) and preschoolers (3–5 years) should be physically active every day for at least three hours, spread throughout the day.
Sedentary behaviour recommendations

- Children younger than 2 years should not spend any time watching television or using other electronic media (DVDs, computer and other electronic games).
- For children aged 2 to 5 years, sitting and watching television and the use of other electronic media (DVDs, computer and other electronic games) should be limited to less than one hour per day.
- Infants, toddlers and preschoolers (all children aged 0–5 years) should not be sedentary, restrained, or kept inactive for more than one hour at a time, with the exception of sleeping.

Physical Activity and Sedentary Behaviour Guidelines for children aged 5–12

Physical activity recommendations

- For health benefits, children aged 5–12 years should accumulate at least 60 minutes of moderate to vigorous intensity physical activity every day.
- Children’s physical activity should include a variety of aerobic activities, including some vigorous intensity activity.
- On at least three days per week, children should engage in activities that strengthen muscle and bone.
- To achieve additional health benefits, children should engage in more activity — up to several hours per day.

Sedentary behaviour recommendations

- To reduce health risks, children aged 5–12 years should minimise the time they spend being sedentary every day.
- To achieve this, limit use of electronic media for entertainment (e.g. television, seated electronic games and computer use) to no more than two hours a day — lower levels are associated with reduced health risks.
- Break up long periods of sitting as often as possible.

Physical Activity and Sedentary Behaviour Guidelines for young people aged 13–17

Physical activity guidelines

- For health benefits, young people aged 13 to 17 years should accumulate at least 60 minutes of moderate to vigorous intensity physical activity every day.
- Young people’s physical activity should include a variety of aerobic activities, including some vigorous intensity activity.
- On at least three days per week, young people should engage in activities that strengthen muscle and bone.
- To achieve additional health benefits, young people should engage in more activity — up to several hours per day.

Figure 11.12 Vigorous activities provide additional health benefits.
Sedentary behaviour guidelines
- To reduce health risks, young people aged 13–17 years should minimise the time they spend being sedentary every day.
- To achieve this, limit use of electronic media for entertainment (e.g. television, seated electronic games and computer use) to no more than two hours a day — lower levels are associated with reduced health risks.
- Break up long periods of sitting as often as possible.

![Figure 11.13](image-url) Most school students spend long periods of time sitting during the school day. Teachers should find ways to get students to be more active during classes.

Physical Activity and Sedentary Behaviour Guidelines for adults aged 18–64

Physical activity guidelines
- Doing any physical activity is better than doing none. If you currently do no physical activity, start by doing some, and gradually build up to the recommended amount.
- Be active on most, preferably all, days every week.
- Accumulate 150 to 300 minutes (2½ to 5 hours) of moderate intensity physical activity or 75 to 150 minutes (1¼ to 2½ hours) of vigorous intensity physical activity — or an equivalent combination of both moderate and vigorous activities — each week.
- Do muscle strengthening activities on at least 2 days each week.

Sedentary behaviour guidelines
- Minimise the amount of time spent in prolonged sitting.
- Break up long periods of sitting as often as possible.

Physical Activity Recommendations for older Australians aged 65 and over

Physical activity guidelines
- Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.
Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.

- Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.
- Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up the recommended amount, type and frequency of activity.
- Older people who continue to enjoy a lifetime of vigorous physical activity should carry on doing so in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.

**Figure 11.14** There are many opportunities for older Australians to engage in low impact activities that promote health, such as water aerobics.

**TEST your understanding**

1. Explain the correlation between sedentary behaviour and health outcomes.
2. Provide advice to a 15-year-old about the Australian Physical Activity and Sedentary Behaviour Guidelines that they should be following.
3. You overhear one of your parents saying they are too busy to exercise every day. Describe the duration and intensity recommended for your parent each week.
4. What type of activities are recommended for older Australians as described in the physical activity guidelines?

**APPLY your understanding**

5. A 9-year-old child is swimming for at least an hour per day at the appropriate intensity for health gains. They do no other type of activity. Recommend another activity for this child to add to their weekly schedule. Justify your selection with reference to the Australian Physical Activity Guidelines for children.

6. An adult who has been sedentary is not expected to start exercising and meet the Australian Physical Activity Guidelines immediately. With reference to the guidelines, provide advice to this adult.

7. Compare the types of physical activities recommended for adults versus older adults (over 65 years of age).
There are many reasons why assessment of physical activity and sedentary behaviour at the population level is desired. These include the following:

- to provide an evidence base for the behavioural determinants of health
- to help understand the key issues relating to physical activity and inactivity
- to track progress or lack of progress over time at a population level
- to highlight disadvantaged groups so that specific interventions can be developed
- to ensure appropriate interventions can be designed, implemented and assessed.

In addition to assessing physical activity and inactivity for populations, there is value in assessing them at an individual level. Some benefits of assessing an individual's physical activity and sedentary behaviour include the following:

- to gather specific information about an individual
- to provide more accurate data for an individual, so appropriate strategies can be tailored to that person
- to provide information to enable an individual to highlight strengths and weaknesses of their daily movement patterns
- to use the information as a motivational tool to encourage increased physical activity
- to use the information as a motivational tool to discourage sedentary behaviour
- to track an individual's level of activity over time to highlight patterns of behaviour (e.g. increased levels of sedentary behaviour over winter) so that trends can be identified and appropriate interventions put in place.

There are a range of assessment tools. These are often categorised as either subjective or objective.

**Subjective assessment** is information obtained from a person's perception, understanding and interpretation of an event.

**Objective assessment** is information obtained via measurable or observable means.

**Using recall surveys**

Recall surveys are a commonly used subjective measurement tool for assessing the physical activity and sedentary behaviour levels of a population, due to their ease of administration and cost-effectiveness. Depending on the purposes of the survey, there are a variety of types of recall surveys, ranging from very brief surveys right through to significantly more detailed versions.
As a subjective method, recall surveys typically ask an individual to recall their levels of physical activity or sedentary behaviour over a given time frame. Short recall surveys are the quickest and easiest to undertake. This type of survey provides a swift assessment of both the domains and dimensions of physical activity, providing a basic overview of the physical activity and inactivity levels of population groups.

Surveys like this would typically use a smaller number of questions and either be completed by an individual (known as a self-administered survey) or by an interviewer. Longer self-recall surveys can be used and generally capture broad information. For example, a survey of an adult who is asked to recall the amount of sport and exercise they did as a child will have limited scope to record accurately the dimensions of health. An estimation of the type and frequency of sport might be all the researcher asks in such a survey. Examples of surveys include:
- the Adolescent Physical Activity Recall Questionnaire
- the Adolescent Sedentary Activity Questionnaire
- the Children’s Leisure Activities Survey
- the Australian Health Survey.

The main advantages of recall surveys are:
- they are a cost-effective way of collecting large quantities of data
- they are easy to administer and complete
- they can be used in a variety of formats including digital and paper
- they can be used to collect a broad range of data
- they can take into consideration the context of physical activity and sedentary behaviour.

The main disadvantages include:
- an increased likelihood of lower accuracy of data due to poor recall and a lack of understanding of the survey's requirements
- **social desirability bias**, when respondents exaggerate their physical activity levels and underestimate their level of sedentary behaviour
- the difficulty of accurately recalling details of past events, particularly over a longer period of time
- they are not suitable for children under 10 years of age and older adults due to cognitive limitations of these respondents.

### Using diaries

Diaries are another subjective method of assessing levels of physical activity and sedentary behaviour. They share similar advantages to that of recall surveys, with both ease of administration and low cost as reasons why they are considered as a method of data collection. In comparison to recall surveys, diaries can be used to record information whenever it is desired by those administering the test. For example, information may be recorded hourly or daily. As the person filling out the diary doesn’t have to recall information over a prolonged period, the accuracy of information is likely to be better.

Some disadvantages include the following:
- The diary may become a burden to the person as they have to to input information regularly.
- Respondents become **reactive** to the presence of the assessment tool and therefore temporarily increase their physical activity levels, which reduces the chances of an accurate reflection of typical physical activity and inactivity levels.
- Diaries are prone to social desirability bias.
- Compared to surveys (which tend to make comparisons based on set questions), diaries tend to have less prescriptive questions and it is therefore harder to compare responses from different people.

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**Social desirability bias** is the tendency of individuals to respond to questions in a survey in a way that they think will be viewed favourably by others, which often results in overreporting ‘good behaviour’ and underreporting ‘bad behaviour’.

**Reactivity** is the change in the behaviour of an individual who is aware they are being assessed.
Assessment of physical activity and sedentary behaviour

For both recall surveys and diaries there is an option to have an adult take a survey or fill in a diary on behalf of somebody else. Known as a proxy survey or proxy diary, these are used to collect data on behalf of those with limited cognitive ability, including children under 10, the elderly over 80 and those with mental disabilities. A proxy report would typically be carried out by a parent, guardian, primary carer or a teacher.

Using pedometry as an assessment tool

A pedometer is a tiny device that clips onto a person’s belt or clothing to measure the quantity of steps taken (usually daily steps). It collects data and, depending on the type of model, can estimate the total distance covered during a day as well as the energy expenditure as a result of those steps. Due to its capacity to collect data it is categorised as an objective assessment tool when collecting information regarding physical activity levels.

The advantages of pedometers for assessing levels of activity include the following:
- They are a cheap tool (can be purchased from as little as a few dollars).
- There are a range of types with different functions including steps taken, distance covered and energy expended.
- Some can be synced to other digital devices for recording of data collection.
- They are easy to use.
- They can record incidental exercise that occurs as a normal part of a person’s day — activity that is often overlooked in surveys or diaries.

The disadvantages of using pedometers to assess levels of activity include the following:
- The limited dimensions that they can record; there is no scope to measure intensity and context.
- They have no capacity to record upper body movement, nor can they measure swimming, cycling or gymnasium activity.
- They can be quite inaccurate for distance covered, particularly if users alter their usual stride length; this includes going up and down hills and stairs or engaging in physical activity such as running or playing sport.
- Users often experience reactivity when wearing a pedometer; this reduces the accuracy of data collected if used to measure the activity levels of an individual for the purposes of a population assessment of physical activity and sedentary behaviour.
- They do not record sedentary behaviour.
Using accelerometry as an assessment tool

Similar to pedometers, accelerometers use motion sensors to detect movement and are also classified as an objective tool. Accelerometers record movement recorded by tiny transmitters inside the unit. There are various types of accelerometers, from single transmitters that sense acceleration in one plane (known as a uni-axial accelerometer) through to three transmitters (tri-axial transmitters) that can measure acceleration in all three planes and therefore provide more accurate information about movement. Accelerometers should generally be worn over a 7-day period to reflect physical activity and inactivity during a typical week. They can be worn on the hip, ankle or wrist.

Contemporary models of accelerometers are incorporating the use of inclinometry to record more accurate data, particularly sedentary behaviour. Inclinometers are mechanical or electronic devices that are used as an objective form of data collection. Inclinometers measure the angle of slope of an object including the angle of incline of a human body, and hence can determine whether or not a person is lying, sitting or standing. There are various names for inclinometers, including tilt or slope meters.

Some advantages of using accelerometers include:
- their small size
- their ability to be worn continuously over an extended period of time (not including showering, sleeping etc.)
- the recording of both physical activity levels and sedentary behaviour
- the lack of visual feedback to the wearer, which decreases reactivity
- their ability to record frequency, intensity, duration and estimated energy expenditure
- their ability to be combined with inclinometers to increase accuracy with which sedentary behaviour is recorded.

Some disadvantages include the following:
- They can still cause some reactivity (although less than other modes of observation tools such as pedometers).
- Each accelerometer needs to be calibrated to each individual.
- They are not accurate at measuring sedentary behaviour (e.g. they will often record static physical activity as inactivity), although when combined with inclinometers the accuracy can be improved.
- They cannot record context and type of physical activity.

Direct observation as an assessment tool

The aim of direct observation is to collect data that measure a participant’s physical activity by type, duration, intensity and context of physical activity and inactivity. It offers an advantage over many other subjective and objective methods, such as decreasing the burden on people being assessed and improved accuracy. A trained observer is used to describe what the participant does in a particular setting. The trained observer would typically use a computer software program or application to record the information. Two common examples are SOFIT and SOPLAY; however, there are other digital direct observation tools which are increasingly being used.
11.3 Assessment of physical activity and sedentary behaviour

SOFIT
SOFIT (System for Observing Fitness Instruction Time) is designed to measure student physical activity, lesson context and teacher behaviour during physical education classes. It will generally assess four students’ levels of physical activity per class.

**TABLE 11.2 What SOFIT measures**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student activity levels</td>
<td>Including lying, sitting, standing, moderate (including walking) or vigorous activity</td>
</tr>
<tr>
<td>Lesson context</td>
<td>Analyses time spent in general content time (where students are not intended to be active during a physical education class), knowledge content time (where the prime focus is on student acquisition of knowledge) and PE motor content (including fitness, skill practice, game play and other free play)</td>
</tr>
<tr>
<td>Teacher behaviour</td>
<td>Collects information as to whether the teacher’s behaviour or involvement promotes student physical activity</td>
</tr>
</tbody>
</table>

SOPLAY
SOPLAY (System for Observing Play and Leisure Activity in Youth) is used to directly assess physical activity in free-play settings, such as during recess and lunch, in school students. It uses a trained observer to collect data either manually or digitally on the behaviour of groups of people in particular settings. This is done via a series of regular scans within the targeted setting. This includes:
- the number of students being active
- the type of activity
- the frequency of activity
- context, such as time of day, environmental conditions, temperature, presence of supervisors, area usability and availability of equipment
- behaviour comparisons of males versus females
- intensity of activity (either sedentary, walking or very active).

A similar program called SOPARC (System for Observing Play and Recreation Activity in Communities) is used in other community settings.

**FIGURE 11.19** Organisations such as Active Living Research use observation tools such as SOFIT, SOPLAY and SOPARC to measure levels of physical activity and sedentary behaviour.

**Other digital tools for direct observation**
In contemporary times the increased use of digital tools to observe physical activity and sedentary behaviour is evident. Many of these are available as smart phone and/or
tablet apps, making direct observational tools more accessible and easy to use for the general population. Some examples of such digital applications include:

- **TimeMotion**, which allows the recording of an individual's activity during an activity (even via recorded video footage). These can be specifically tailored to particular sports.
- **ISOPARC**, which is a new digital application that is designed to work in conjunction with both SOPARC and SOPLAY. In addition to all of the data collected via SOPLAY and SOPARC, it permits the collection and exportation of photos, and enables the identification, mapping, and spatial area calculation of target areas using the GPS technology of a compatible tablet or phone.

Some of the advantages of direct observation include the following:

- It is useful for assessing the activity levels of children in a range of settings.
- The use of trained observers increases the accuracy of data collected.
- There are free online guides for teachers and other data collectors who are interested in using assessment tools such as SOFIT and SOPLAY.
- It has the capacity to be used in conjunction with other methods, such as accelerometry, to provide a more accurate description of physical activity levels.

Some of the disadvantages include the following:

- It can be time consuming to collect and analyse data.
- It can be costly if trained professionals need to be used to increase accuracy.
- An awareness of the observer may increase reactivity.
- There is decreased accuracy when group size increases.

### Using personal activity trackers

For many years digital activity trackers, such as accelerometers, have been used extensively in research settings to assess the overall levels of physical activity, sedentary behaviour, sleep patterns and daily energy expenditure. They were expensive but tracked physical activity levels accurately. Due to advances in technology, there have been significant improvements in the design of digital activity trackers, minimising the need for accelerometers.

The new forms of digital activity trackers use similar technology to accelerometers (and most incorporate an accelerometer), but have become significantly smaller, cheaper and accessible to both researchers and the general public. They have also become more personal, as users can easily input personal information that helps improve the accuracy of data collected. Some examples of the use of digital activity trackers include a range of applications on smartphones and computers. There is also a growing market of wearable technology being used to measure physical activity, such as watches and wristbands.
Personal activity trackers use some or all of the following sensors: accelerometers; thermometers, ambient light sensors and UV sensors; inclinometers; optical heart rate monitors and GPS (global positioning system). There is a variety of types available for use. They can measure a range of dimensions in any of the following combinations:
- steps taken
- distance travelled
- speed of movement
- sedentary behaviour, including sleep time
- energy expenditure (using algorithms to estimate this dimension based on body weight, duration and intensity of movement)
- intensity via heart rate (through the skin via watch or bracelet)
- different modes of activity such as running, walking or cycling.

![Figure 11.21](image)

**FIGURE 11.21** Many athletes rely on digital technology to support their training.

Some of the main advantages of digital activity trackers are that they:
- can potentially measure any dimension with some degree of accuracy
- have the capacity to record physical activity and sedentary behaviour
- have the capacity to be used in different environments, including in the water
- are easy and comfortable to wear
- have settings that can be personalised for the individual wearer.

Some of the main disadvantages of digital activity trackers are that they:
- are costly for some people
- have reduced accuracy for certain types of physical activity, such as free play, and activities that involve movement without leaving a position in space (e.g. wearing a GPS watch will not record movement on a treadmill or stationary bike).
Selection of an assessment tool is dependent on a range of factors. There is generally an inverse relationship between accuracy and practicality in the collection of physical activity and sedentary behaviour data. In other words, the higher the accuracy the lower the practicality and the lower the accuracy the higher the practicality.

**TEST your understanding**

1. List three reasons why assessment of physical activity and sedentary behaviour at the population level is necessary.
2. List three reasons why assessment of physical activity and sedentary behaviour at the individual level is necessary.
3. Explain the difference between a recall survey and a recall survey by proxy. In what circumstances should a proxy recall survey be used as a physical activity assessment tool?
4. Describe the difference between an accelerometer and an inclinometer.
5. Describe why direct observation offers an advantage over other subjective and objective physical activity and sedentary behaviour assessment tools.
6. You are a primary school PE teacher. You are trying to encourage students to increase their level of movement during the school day. You have heard that pedometers cause reactivity. Explain what the term reactivity means. Outline two advantages and disadvantages of using pedometers in such a school context.
7. Research the latest digital physical activity trackers. Select one that would suit your lifestyle and describe what this tool can measure.
8. **Practical activity:** Select a digital physical activity tracker for use during a practical class. Compare the data collected with data from other students in the class. Discuss the advantages and disadvantages of your choice compared with others.

**FIGURE 11.22** Fitness trackers are useful for people who are trying to increase their level of physical activity and want to quantifiy their progress.
KEY CONCEPT  The federal government routinely collects data on the habits of Australians, including physical activity and inactivity and the many factors that influence such behaviour.

Periodically the federal government commissions surveys of the population to identify current trends in Australian society. The 2011–2013 Australian Health Survey is the largest and most detailed health survey ever to be undertaken in Australia, and allowed the federal government to collect broad data from a large sample size. A group of healthcare professionals was gathered from a wide range of sectors to oversee the survey process, including government and non-government organisations. The Australian Health Survey comprised the following three components:

- the National Health Survey (NHS)
- the National Nutrition and Physical Activity Survey (NNPAS)
- the National Health Measures Survey (NHMS).

These surveys were conducted on behalf of the federal government by the Australian Bureau of Statistics (ABS). This data is helpful for healthcare professionals because it not only identifies current trends in health status, but it also highlights potentially disadvantaged groups and individuals.

**FIGURE 11.23** The logo of the Australian Bureau of Statistics

### Physical activity and sedentary behaviour

As part of the Australian Health Survey an investigation was made into the physical activity and sedentary levels of Australians. To fully comprehend the data presented in this chapter, an understanding of the Australian Bureau of Statistics definitions is essential. See table 11.3 below for an outline of these definitions.

<table>
<thead>
<tr>
<th>TABLE 11.3 Definitions of physical activity corresponding to different age groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children 2–4</strong></td>
</tr>
<tr>
<td>Includes any active indoor or outdoor play</td>
</tr>
</tbody>
</table>

**WebLink**

Australian Health Survey
Sedentary behaviour includes time spent sitting or lying down for various activities over the last week. This includes waiting for transport, sitting while in transit, playing computer games, using the internet, watching television, talking or texting on a phone and leisure activities that are low in intensity. This includes playing chess, reading a book, going to the movies or having a barbeque.

Children’s physical activity and sedentary behaviour guidelines

The Australian Physical Activity Guidelines for children highlight the importance of play and being active throughout each day. For children under 5 years of age the guidelines encourage at least three hours of physical activity per day while for children and adolescents aged 5 to 17 at least 60 minutes up to several hours per day is recommended, with an emphasis on aerobic activities and those that strengthen muscle and bone.

In regards to Australia’s Sedentary Behaviour Guidelines, children age 2 to 5 years are recommended to not be sitting, watching television or using other forms of electronic media, for any more than one hour per day. For children and adolescents aged between 5 and 17, sedentary behaviour should be limited to two hours per day, excluding for school-based purposes.

So how are Australian children and adolescents doing in regards to both the sedentary behaviour and physical activity guidelines? There is significant room for improvement. The results show that:

- only one in five Australian children aged between 2 and 4 currently meets both physical activity and screen-time guidelines, dropping to about one in ten children and adolescents aged between 5 and 17 years.
- three out of four children aged between 2 and 4 did not meet both the physical activity and screen-time guidelines, rising to 9 out of 10 children and adolescents aged between 5 and 17.
25 per cent of children aged between 2 and 4 do meet physical activity and sedentary behaviour guidelines.

75 per cent of children aged between 2 and 4 do not meet physical activity and sedentary behaviour guidelines.

80 per cent of children aged 5–17 did not meet physical activity guidelines.

20 per cent of children aged 5–17 met physical activity guidelines.

For this age group (2 to 4) there were some other interesting findings from the Australian Health Survey. Overall they indicate that the major issue is with children spending too much time in front of a screen, with the data highlighting that most young children are active enough. The data shows that for children between 2 and 4 years of age approximately:

- seven out of ten children meet the physical activity guidelines
- seven out of ten children spend excessive time using electronic media, the bulk of this time watching television and DVDs
- children are active on average for 6 hours per day, with close to half indoor play and half outdoor play
- children engage in sedentary behaviour using electronic media for 83 minutes per day
- all data for both boys and girls are similar with variations not being statistically significant.
For 5- to 17-year-olds, the data indicates that approximately:

- Two in ten meet the physical activity guidelines
- Three in ten meet the screen time guidelines
- 90 minutes of physical activity is undertaken per day, comprising of mainly non-organised activities such as walking, play and other games
- 136 minutes are spent a day on sedentary screen-based activities, with 84 minutes dedicated to watching television and DVDs, 21 minutes playing electronic games and an additional 25 minutes using the internet for non-homework purposes
- All data for both boys and girls are similar with variations not being statistically significant

**Relationship between age and physical activity and sedentary behaviour**

Table 11.4 outlines the relationship between age and the levels of physical activity and sedentary behaviour in the Australian population (aged 15 and over). The data indicates some clear patterns.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>15–17</th>
<th>18–24</th>
<th>25–34</th>
<th>35–44</th>
<th>45–54</th>
<th>55–64</th>
<th>65–74</th>
<th>75 years and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of persons (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedentary</td>
<td>21.4</td>
<td>29.4</td>
<td>31.2</td>
<td>34.3</td>
<td>36.0</td>
<td>37.1</td>
<td>40.3</td>
<td>56.9</td>
</tr>
<tr>
<td>Low</td>
<td>30.9</td>
<td>30.0</td>
<td>31.1</td>
<td>32.8</td>
<td>32.7</td>
<td>33.5</td>
<td>31.1</td>
<td>25.8</td>
</tr>
<tr>
<td>Moderate</td>
<td>25.7</td>
<td>21.6</td>
<td>21.0</td>
<td>19.9</td>
<td>19.9</td>
<td>23.0</td>
<td>24.6</td>
<td>15.6</td>
</tr>
<tr>
<td>High</td>
<td>21.8</td>
<td>19.0</td>
<td>16.7</td>
<td>12.9</td>
<td>11.2</td>
<td>6.2</td>
<td>4.1</td>
<td>*1.5</td>
</tr>
<tr>
<td>Total(b)</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Estimate has a relative standard error of 25 to 50 per cent and should be used with caution.
(a) Level of exercise undertaken for fitness, recreation or sport in the last week.
(b) Includes level of exercise not stated.


There is a direct relationship between ageing and an increase in sedentary behaviour. This is a concern as there are clear links between inactivity and poorer health outcomes.

There is a relatively consistent pattern of low-intensity physical activity undertaken across all age groups up until the 65–74 age bracket. For most aged people 15 or over, about one in three people (close to 33 per cent) engage in low intensity physical activity at least once per week.

Similar to low-intensity exercise there is a relatively consistent level of medium-intensity exercise undertaken at least once per week, averaging out to approximately 20–25 per cent across the age groups.

The most significant changes seen in the data involve the decline of high-intensity exercise across all age groups, with about one in five people engaging in this type of activity at least once a week in the 15–19 age bracket, compared to only about one in 20 (4 per cent) in the oldest age group surveyed, the 65–74 age group.

The data from the Australian Health Survey shows that as people get older they are likely to maintain similar levels of low and moderate physical activity but experience
a decline in high-intensity exercise. There is also a clear relationship between ageing and an increase in sedentary behaviour. The reduction of high-intensity exercise combined with increased sedentary behaviour will have a significant impact on the physical, social and emotional health of older Australians.

**Comparison of male and female physical activity and sedentary behaviour**

The data comparing physical activity and sedentary behaviour for males and females shows some similarities and differences. The similarities include:
- an increase in the quantity of sedentary behaviour as both males and females age
- a significant drop in high-intensity exercise in both males and females as they get older
- a relatively stable quantity of low and moderate physical activity conducted per week.

Although there are similarities between the physical activity and sedentary behaviours of males and females there are also some significant differences. The major disparities between males and females include the following:
- Males are more likely to engage in medium- and high-intensity exercise while females are more likely to engage in behaviour that is categorised as sedentary, as well as low intensity activity.
- Sedentary behaviour in females between 15 and 18 years of age is double that of males, with sedentary behaviour exhibited in approximately 28 per cent of females in this age group compared to only 14 per cent in males.
- A rapid increase in sedentary behaviour occurs in males as they enter adulthood (ages 18–24). Sedentary behaviour almost doubles during this time (14.5 per cent to 27.4 per cent), while for females only a small increase in sedentary behaviour is shown from 28.7 per cent to 31.5 per cent.
- In people aged from 35 to 74 the level of sedentary behaviour in both males and females remains very similar. In the oldest age group surveyed, however, there is a marked increase in sedentary behaviour and a decrease in low-intensity physical activity in females. For males there is a much smaller increase in sedentary behaviour and decrease in low-intensity physical activity.

**FIGURE 11.27** For every sedentary male aged 15–17, there are two sedentary females aged 15–17.
Making sense of the data

As discussed previously in this chapter, the Australian Physical Activity and Sedentary Behaviour Guidelines have been devised to educate people about the link between being physically active and good health. These guidelines can be used to measure whether people are being active enough to result in health gains, both in terms of the frequency, duration, type and intensity of activity in addition to sedentary behaviour.

The data in table 11.5 shows whether people are meeting these guidelines. The guidelines for adults advise 150 to 300 minutes (2½ to 5 hours) of moderate-intensity physical activity or 75 to 150 minutes (1¼ to 2½ hours) of vigorous-intensity physical activity, or an equivalent combination of both moderate and vigorous activities, each week. The insufficiently active group indicates that there are approximately one in three Australians who do some activity but not enough to result in health benefits. The trend across the age groups indicates that as people age they are more likely to become inactive and less likely to be sufficiently active for health gains.

Australian adults spent only 3.8 hours per week engaged in physical activity. This is compared to 28.9 hours being sedentary during their leisure time. In other words, for every hour an Australian adult is active they spend 9 hours being inactive!

<table>
<thead>
<tr>
<th>TABLE 11.5 Summary activity indicators by age in persons aged 18 years and over</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group (years)</strong></td>
</tr>
<tr>
<td>Proportion of persons with sufficient physical activity in last week</td>
</tr>
<tr>
<td>Inactive</td>
</tr>
<tr>
<td>Insufficiently active</td>
</tr>
<tr>
<td>Sufficiently active for health</td>
</tr>
<tr>
<td>Total (a)</td>
</tr>
</tbody>
</table>

(a) Includes time not known.

Relationship between location and levels of physical activity and sedentary behaviour

There is a wide range of influences on how active and inactive Australians are. One influence is where people live. The data from the Australian Health Survey show a trend between healthy behaviour and how close people live to a major city. People who live in major cities have a lower rate of inactivity and a higher rate of being physically active enough for health gains. The rate of inactivity in adults living in major cities is 18 per cent, but climbs to 25 per cent in people who live in regional and remote areas. For physical activity for health benefits 45 per cent of Australian adults meet the guidelines, but this drops below 40 per cent for people living in regional and remote areas.

There are not only differences in the health-related behaviours of people living in city or regional areas, the Australian Bureau of Statistics data highlights that there are differences in the levels of physical activity and inactivity between the states and territories.

The most active people reside in the ACT, with only 16 per cent of the people inactive in the week leading up to the survey, 33 per cent were active but not at a level that would benefit health, and approximately half of the population were sufficiently active for health. People living in the Northern Territory were the least active, with only 37 per cent of the population sufficiently active according to the Australian Physical Activity Guidelines.

**Figure 11.29** According to ABS data, ACT residents are the most active in Australia with 50 per cent of the ACT’s population engaging in adequate physical activity for good health.
Relationship between socioeconomic status, education, culture and levels of physical activity and sedentary behaviour

Socioeconomic status

There are clear links between a person’s socioeconomic status and their engagement in health-related behaviours, including physical activity. The term socioeconomic status refers to an individual or group’s social and economic standing, taking into consideration a range of factors that include education levels, employment status and income. The Australian Bureau of Statistics uses a variety of ways to link socioeconomic status to health-related behaviour, including the link between socioeconomic disadvantage and physical activity and inactivity.

Table 11.6 demonstrates the relationship between socioeconomic disadvantage and higher levels of inactivity and lower levels of physical activity sufficient for health gains. It uses a measurement called the Index of Relative Socioeconomic Disadvantage. This measurement stems from a range of variables. These variables include:
- level of income
- level of education
- level of employment
- skilled versus unskilled occupations.

This information is used to highlight areas of advantage which score highly on the index and areas of disadvantage that score low on the index. Areas are then ranked and placed within quintiles, (defined as any of five equal groups into which a population can be divided). The data clearly demonstrates the correlation between socioeconomic disadvantage and lower levels of physical activity for health purposes. This correlation is the same regarding levels of inactivity: highest in the first quintile (most disadvantaged population group) and lowest on the fifth quintile (most advantaged population group).

| Table 11.6 Sufficient physical activity measured by selected population characteristics, persons aged 18 years and over |
|-----------------------------------------------|---------------|---------------|------------------|------------------|
| Participation in sufficient physical activity in last week | Inactive | Insufficiently active | Sufficiently active for health | Total 18 years and over |
| Proportion of persons (%) | |
| **Index of Relative Socioeconomic Disadvantage** | | | | |
| First quintile (most disadvantaged) | 26.5 | 38.3 | 34.0 | 100.0 |
| Second quintile | 23.0 | 36.7 | 39.2 | 100.0 |
| Third quintile | 20.4 | 35.5 | 42.5 | 100.0 |
| Fourth quintile | 18.9 | 34.4 | 46.1 | 100.0 |
| Fifth quintile (most advantaged) | 13.8 | 33.7 | 52.1 | 100.0 |
| **Total** (across the whole population) | 20.3 | 35.7 | 43.0 | 100.0 |

**Source:** ABS, Australian Health Survey: Physical Activity, 2011–12.

The results of the Australian Health Survey also show the relationship between equivalised household income and the levels of physical activity and inactivity. Equivalised household income is estimated from the income of a household and their relative wellbeing. As in the index of socioeconomic disadvantage, there are
clear relationships between the most advantaged subset of a population and healthy behaviour.

The data reflects a distinct relationship between increased household income and increased level of physical activity for health gains and lower rates of inactivity. The results signal a massive difference between the most advantaged and disadvantaged. Economically disadvantaged households are approximately 2.5 times more likely to be inactive (27 per cent compared to 11.5 per cent).

Education

There is a clear relationship between a person’s level of education and the likelihood they will engage in lower levels of inactivity and higher levels of activity sufficient enough for health benefits. Approximately 25 per cent of Australian adults who leave school without a qualification are categorised as inactive compared to only approximately 8 per cent of holders of postgraduate degrees. Early school leavers are three times more likely to be categorised as sedentary. The data also highlights that the most educated are the most active, with six in ten postgraduate degree holders active enough for health benefits.
Cultural influences

For Australians born here and overseas, there are few differences in both the levels of inactivity and levels of physical activity sufficient for health gains. There are, however, some major differences between people from different parts of the world.

Residents in Australia born in the United Kingdom and other North-west European countries (e.g. Belgium, Ireland, the Netherlands, Sweden, Denmark and Norway) show the highest rate of physical activity for health purposes, significantly higher than other parts of Europe, Asia, Africa and the Middle East.

Residents in Australia born in Southern and Eastern Europe (e.g. Albania, Cyprus, Greece, Bulgaria, Croatia, Serbia), North Africa and the Middle East show high levels of inactivity, with approximately one in four adults not exercising at all in the week leading up to the survey.

**Figure 11.32** This map shows the percentages of overseas-born Australians who are sufficiently active for health. Overall, Australians born in Europe are most active; Australians born in Africa are least active.

**TEST your understanding**

1. Why does the government collect health data from surveys?
2. Provide four examples of sedentary behaviour as outlined in the Australian Health Survey.
3. What percentage of Australian children aged between 5 and 17 met both the physical activity and screen-based activity recommendations?
4. What is meant by the term ‘Index of Relative Socioeconomic Disadvantage’? Discuss the relationship between this index and levels of physical activity measured in the Australian population.
**APPLY your understanding**

5 A friend of yours is looking at the relationship between income and level of physical activity. Your friend says that the fifth quintile according to income has the highest level of physical activity while the first quintile has the lowest level of physical activity. Your friend asks you to clarify this statement to help him/her understand what this means.

6 View the following data comparing people who live in major cities, inner regional areas and outer regional/remote areas of Australia. What trends can be identified from this data?

<table>
<thead>
<tr>
<th>Participation in sufficient physical activity in last week</th>
<th>Inactive</th>
<th>Insufficiently active</th>
<th>Sufficiently active for health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of persons (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major cities of Australia</td>
<td>18.3</td>
<td>35.3</td>
<td>45.4</td>
</tr>
<tr>
<td>Inner regional Australia</td>
<td>25.4</td>
<td>37.3</td>
<td>36.0</td>
</tr>
<tr>
<td>Outer regional and remote Australia</td>
<td>25.2</td>
<td>34.6</td>
<td>39.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>20.3</td>
<td>35.7</td>
<td>43.0</td>
</tr>
</tbody>
</table>

*Source: ABS, Australian Health Survey, 2012.*

7 The following data compares the proportion of people (%) mapped to their level of exercise. Describe the relationship between exercise intensity and ageing using data from the table. For each level of exercise give an example of an activity that would fit into each category.

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>15–17</th>
<th>18–24</th>
<th>25–34</th>
<th>35–44</th>
<th>45–54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedentary</td>
<td>21.4</td>
<td>29.4</td>
<td>31.2</td>
<td>34.3</td>
<td>36.0</td>
</tr>
<tr>
<td>Low</td>
<td>30.9</td>
<td>30.0</td>
<td>31.1</td>
<td>32.8</td>
<td>32.7</td>
</tr>
<tr>
<td>Moderate</td>
<td>25.7</td>
<td>21.6</td>
<td>21.0</td>
<td>19.9</td>
<td>19.9</td>
</tr>
<tr>
<td>High</td>
<td>21.8</td>
<td>19.0</td>
<td>16.7</td>
<td>12.9</td>
<td>11.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Source: ABS, Australian Health Survey, 2012.*

8 Design your own physical activity and sedentary behaviour questionnaire with the aim of recording these behaviours over a week. Compare this data with the data collected for a person your age and gender in the Australian Healthy Survey.
KEY SKILLS

- Participate in physical activity, and collect, analyse and reflect on information related to the physical, social, mental and emotional health benefits of physical activity.
- Explain the health consequences of physical inactivity and sedentary behaviour.
- Describe the physical activity and sedentary behaviour guidelines for different stages across the lifespan.
- Use appropriate methods to measure and analyse physical activity and sedentary behaviour levels at the individual and population level.
- Collect, analyse and interpret primary and secondary data related to trends in participation in physical activity.

UNDERSTANDING THE KEY SKILLS

To address these key skills, it is important to remember the following:
- Involvement in and analysis of involvement in physical activity.
- Link healthy behaviour with promotion of all the dimensions of health.
- The Physical Activity and Sedentary Behaviour Guidelines need to be mapped to the appropriate age classification.
- Select appropriate assessment methods when asked to measure and analyse both physical activity and sedentary behaviour levels, for either an individual or for a large population group.
- When selecting the appropriate method, students need to go through the advantages and disadvantages of the assessment methods in order to justify their selection.
- During the data collection period, students may need to collect their own data (primary data) or work with data collected from other people or researchers (secondary data).

PRACTICE QUESTION

Sally, a 15-year-old secondary-school student engaged in the following physical activity during one week.

- Frequency of activity = 7 days
- Intensity of activity = moderate
- Total duration over the week = 120 minutes
- Type = Aerobic activities including running and swimming

(a) Using the information above, describe the area of weakness for Sally, an adolescent, in relation to one of the four dimensions of the Australian Physical Activity Guidelines. 2 marks

(b) Using your knowledge of the guidelines, recommend to Sally what she needs to do to meet all four of the dimensions listed above. 1 mark

(c) Name and describe two chronic health conditions that could be a consequence of limited physical activity. 4 marks

Sample response

(a) The area of weakness for Sally is the total duration of activity over the week. According to the guidelines, being active every day for at least 60 minutes per day means that at least seven hours of physical activity should be completed over the week whereas Sally has only accumulated 120 minutes (2 hours).

(b) To meet the guidelines, she needs to participate in an extra five hours per week of exercise at the appropriate intensity.

(c) If she doesn’t then she is at a higher risk of suffering from chronic health conditions such as diabetes mellitus and obesity. Diabetes mellitus is a condition where blood sugar levels are difficult to maintain due to problems with production of or response to insulin secretion. Obesity is a condition where excessive body fat is carried by an individual.

PRACTISE THE KEY SKILLS

1. Describe the Australian Physical Activity and Sedentary Behaviour Guidelines for children.
2. Explain the health benefits of increased physical activity.
3. Discuss the advantages and disadvantages of direct observation.

KEY SKILLS EXAM PRACTICE

1. Your Physical Education teacher wanted to track the amount of walking done by students during the school day. This task was completed using pedometers, an objective assessment tool.
   (a) Describe the difference between subjective and objective assessment tools. 2 marks
   (b) Describe two advantages and two disadvantages of using pedometers as an assessment tool. 4 marks
The use of recall surveys was proposed but the teacher decided this would not be very accurate. The two reasons cited for making this decision were that the children had cognitive limitations and students may be prone to social desirability bias.

(c) Describe the link between cognitive limitations and recall ability. 1 mark

(d) In regards to social desirability bias, what is likely to happen if students are asked to list the amount of physical activity and sedentary behaviour per day? 2 marks

CHAPTER REVIEW

CHAPTER SUMMARY
- Physical activity is associated with promotion of emotional, mental, social and physical health.
- One dimension of health can have an impact on the other dimensions.
- Chronic health conditions such as diabetes mellitus, some cancers, obesity, cardiovascular disease and osteoporosis are associated with low levels of physical activity and high levels of sedentary behaviour.
- The Australian Physical Activity and Sedentary Behaviour Guidelines have been developed to educate people about the benefits of being active and the dangers of being inactive.
- The Australian Physical Activity and Sedentary Behaviour Guidelines have been developed for children, adolescents, adults and older Australians.
- Assessment of the physical activity and sedentary behaviours of individuals and population groups can be done by using assessment tools, categorised as objective or subjective.
- Subjective assessment tools include recall surveys, proxy reports and diaries.
- Objective assessment tools include pedometers, accelerometers, inclinometers and other digital observation tools.
- There are advantages and disadvantages for each assessment tool.
- Often two or more assessment tools are used to increase the accuracy of the information collected.
- Assessment tools are becoming more accurate due to advances in information communications technology.
- Generally, the higher the accuracy of an assessment tool, the lower the practicality (and vice versa).
- On average, children in Australia spend too much time in front of a screen, not being active.
- There are trends that can be identified via collection of data; for example males are more active than females, and as adults get older they are less likely to engage in vigorous physical activity.
- There is a clear relationship between SES and increased physical activity.
- People in major cities are more active than those in rural and remote areas.
- Cultural influences play a role in determining how much value is placed on physical activity.
- Data collected by government and non-government agencies helps identify at-risk groups of the population due to high levels of inactivity.

MULTIPLE CHOICE QUESTIONS

1 Physical activity has been shown to
(A) increase the chance of illness.
(B) promote mental illness.
(C) increase the chance of diabetes mellitus.
(D) decrease the risk of osteoporosis.

2 Being active improves mental health and reduces the chance of mental illnesses such as
(A) stress, diabetes mellitus and anxiety.
(B) anxiety, depression and stress.
(C) cardiovascular disease and obesity.
(D) obesity, stress and depression.

3 Which of the following is the correct definition of social health?
(A) The ability to be happy
(B) The capacity to get on well with others
(C) The ability to run a marathon
(D) The ability to communicate effectively
4 The recommendations for Australians about appropriate levels of activity and sedentary behaviour are called
(A) Australia’s Physical Activity Guidelines.
(B) National Guidelines.
(C) Australia’s Physical Activity and Sedentary Behaviour Guidelines.
(D) Australia’s Sedentary Behaviour Guidelines.

5 Which of the following statements is correct?
(A) Subjective assessment refers to information obtained from a stopwatch or other measuring device.
(B) Objective assessment refers to information obtained from a person’s ideas.
(C) Objective assessment refers to information obtained from a person’s perception, understanding and interpretation of an event.
(D) Subjective assessment refers to information obtained from a person’s perception, understanding and interpretation of an event.

6 Respondents to surveys exaggerate their physical activity levels and underestimate their level of sedentary behaviour. This is known as
(A) reactivity.
(B) social desirability bias.
(C) cognitive limitations.
(D) reflexivity.

7 Devices that measure steps taken during a day are called
(A) inclinometers.
(B) heart-rate monitors.
(C) accelerometers.
(D) pedometers.

8 SOFIT, a software program used to assess physical activity is used in conjunction with which of the following methods?
(A) Direct observation
(B) Recall survey
(C) Proxy report
(D) Diary

9 The following is a common trend in Australia.
(A) As adults age, their levels of vigorous activity decrease.
(B) Females become more active as they get older.
(C) The older you get, the more active you become.
(D) The less you work, the more physical activity is done.

10 SES is a significant indicator of healthy behaviour. SES is an acronym for
(A) social and economic standards.
(B) student education services.
(C) socioeconomic status.
(D) stable economic situation.

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Exam Question

Question 1
Bill is a 45-year-old man who wants to improve his health. His doctor recommends that he joins a lawn bowls club.

a. Outline the dimensions of the Australian Physical Activity Guidelines for Bill’s age group. (4 marks)

b. Explain the health benefits of involvement in such a sports club.
   - Social benefits (2 marks)
   - Emotional benefits (2 marks)
   - Mental benefits (2 marks)
   - Physical benefits (2 marks)