This chapter focuses on the specific groups of children and young athletes, adult and aged athletes and female athletes. It explores each of these athlete groups in terms of the medical conditions and appropriate management strategies that are commonly associated with the group. It also explores the physical needs and appropriate exercise types for each group.

**Children and young athletes**

*Exercise* and play are important parts of a child’s physical, mental and social development. Children and young people obtain the following benefits from participating in physical activity:

- enjoyment
- social interaction
- improved motor and communication skills
- greater aerobic fitness
- improved coordination
- increased strength
- development of self-esteem
- promotion of physical activity into adulthood.

**WEB**

Websites that give you further information in regards to sports-specific coaching and completing a Beginning Coaching General Principles course online can be accessed via [www.oup.com.au/pdhpe12](http://www.oup.com.au/pdhpe12)
Children are not little adults. They have specific physical capabilities, and special care should be taken when they are involved in sport. Young athletes cannot cope with the same level of training as adults. Intensive training can often be boring, restrictive and socially isolating for maturing young performers. Attention should be paid to their physical, mental and social health, and the pressures of performance should be minimised.

In 2008, Sports Medicine Australia (SMA) released a policy that outlined the safety guidelines for children and young people in sport and recreation. It identified 10 points that will help to ensure young people have a positive and safe experience when engaging in exercise and physical activity (see right).

**Figure 17.1 Considerations for young athletes**

1. Clubs, schools and providers should ensure that they identify, manage and monitor the risks involved in sport and recreation activities.
2. An estimated 50% of all sports injuries are preventable.
3. Coaches should have at least an entry level qualification from a coaching course conducted by the National or State organisation of their sport.
4. A First Aider should be present at all sporting events with participants under 16 years of age. A Sports Trainer should be present at all sporting events with participants over 16 years of age. Any complaint of pain, tenderness, limitation of movement or disability should be promptly referred to a qualified Sports First Aider, Sports Trainer or medical professional for management.
5. Appropriate and properly fitted protective equipment, clothing and footwear should be used at all times.
6. The environment and facilities should be inspected and made safe before participation.
7. All coaches and teachers must be aware of the medical history and other commitments of participants. A pre-season medical and activity questionnaire should be completed by all participants and the current medical state of individuals should be taken into consideration prior and during participation. A medical clearance must be obtained from the treating doctor before any child or young person taking prescription medication participates in sport or physical activity.
8. Warm up, cool down and stretching should be included before and after all participation.
9. Activities for children and young people should be well planned and progress from easy to more difficult. Strength training can be safely introduced to young people provided it is carefully supervised. It should involve low resistance and high repetitions to avoid maximal lifts.
10. To reduce the likelihood of injury match the physical and mental maturity of the child to the level of participation, complexity of the task and the game rules.

Safety Guidelines for Children and Young People in Sport and Recreation, Sports Medicine Australia
Medical conditions

Children with certain medical conditions should avoid contact sports. These include children who:

- have an enlarged liver or spleen
- have only one kidney or one eye
- are haemophiliacs (people who have a hereditary disorder whereby blood does not clot properly)
- have suffered recent head trauma or concussion
- have undescended testes
- have congenital spinal abnormalities (for example, spina bifida).

Certain medical conditions will prevent participation in sport altogether. Some forms of congenital heart defects (a structural problem with the heart) might come into this category.

Medical conditions (including asthma, diabetes and epilepsy) may affect the athletic performance of any person. Children are not necessarily more likely to have these problems, but any athlete who suffers from these conditions should take certain precautions.

It is important for people—especially young people—who suffer from asthma, diabetes or epilepsy to inform their coaches or carers of their condition. This ensures that, if complications do develop, correct responses are more likely. Intensive activity appears to be one of the most important factors in causing problems in all three conditions.

Asthma

Asthma is a narrowing of the airways that makes breathing difficult. Strenuous physical activity can trigger an asthma attack in some sufferers. This is called ‘exercise-induced asthma’ and is very common among asthmatics. It can occur at the start of activity or during activity, but is most common at the end of exercise. Factors that make the condition worse include cold, dry air and exercise of significant intensity and duration. All asthmatic children should have a current asthma management plan that has been developed with a doctor.

Many asthmatic children are encouraged to swim because the fitness gained through swimming greatly benefits asthmatics. Swimming encourages deep breathing. It also facilitates air to be breathed in just above the water’s surface, which is already warmed and humidified. This minimises the risk of an asthma attack occurring.

Asthma does not appear to be a serious barrier to participation if care is taken. The following points should be noted when training asthmatics:

- Ensure the person has an adequate warm-up.
- Don’t ask the person to perform if he or she has had an asthma attack recently.
- Provide opportunity for rest.
- Have the person use preventative medication, if necessary, and ensure it is with the person at all times.
- Take extra care in cold or dry weather, or if the person is suffering from a respiratory infection.
- Know the athlete’s limits.
- Be aware of asthma management techniques and familiar with the individual person’s asthma management plan.

Diabetes

Diabetes can occur in children and later in life. It can be controlled with a proper regimen of:

- diet
- medication
- exercise.
Participants with diabetes need to be aware of how to deal with their condition and the appropriate adjustments and responses that should be made if the above three variables change. Diabetic athletes should prepare themselves for the demands of training or participation by adhering to specific dietary requirements and by monitoring their blood glucose levels.

If diabetics engage in over-strenuous activity they can develop hypoglycaemia. This can cause collapse, and even unconsciousness. If the person develops hypoglycaemia and is still conscious, a glucose substance should be given. Suitable substances include glucose tablets, lollies and drinks. If a diabetic collapses during exercise, glucose should be given immediately, medical attention should be sought, and the patient should be kept calm and warm.

**Epilepsy**

Epilepsy is a condition characterised by seizures that make individuals unable to control their movements. A less severe form of the illness can cause people to have a temporary loss of awareness without a full seizure. Some cases of epilepsy are due to small areas of damage (‘scars’) in the brain but, in most cases, the exact cause is unknown.

Epilepsy can be treated with medication to reduce the incidence of seizures. When participating in physical activity it is important to know that fatigue and extremes of body temperature can trigger an epileptic seizure. Those supervising physical activity should keep a close eye on epileptics in swimming and boating activities.

If an epileptic episode occurs:

- Allow the seizure to occur unrestrained.
- Ensure there is a safe space around the affected person.
- Allow the person to rest after the seizure has ceased.
- If the seizure goes for longer than 10 minutes, seek medical attention.

**Overuse injuries**

Until the age of about 11 or 12 years, boys and girls have similar strength and body proportions. This changes during the growth spurt, which takes place at around 11–13 years in girls and 13–15 years in boys. During the growth spurt, bones grow significantly, muscle mass increases and secondary sex characteristics begin to appear. Injuries in both pre-adolescents and adolescents are usually related to growth imbalances among bones, muscles and tendons. The growth plates of bones are especially affected. Bones can grow faster than muscles and tendons, and this can produce painful inflammatory conditions, especially during exercise.

Fractures are also common because children and younger people are more prone to falls and accidents. This is a result of their lack of experience and care in avoiding dangerous situations.

Injuries in children can be caused by:

- anatomical factors (growth deformities, congenital abnormalities and malalignment in diseases such as scoliosis)
- environmental factors (equipment, weather and playing surfaces)
- the nature of the training program.

Lower back injuries are common in young dancers, gymnasts and bowlers in the sport of cricket. Stress fractures can result from overuse. Children should not overtrain, particularly on hard surfaces. To avoid overuse of particular muscles and joints, children should be allowed to play a number of sports, and to exercise in a variety of positions. Coaches and parents should help to avoid overuse injuries by ensuring appropriate conditioning and stretching programs are undertaken as well as ensuring correct footwear is worn for the sport being played.

**Thermoregulation**

Children are less metabolically efficient than adults. This is because of three important differences between children and adults: compared with adults, children have smaller limbs in relation to torso size, have less-developed sweat glands and have less muscular development.

Since children have smaller limbs in relation to the size of the torso, they have a relatively large skin surface area to body size. They have less fluid in their bodies and more opportunity to lose that small amount of fluid through their relatively large skin surface area. Children are thus much more likely to lose fluid and dehydrate than are adults.

Even though they have a relatively large skin surface area, through which they can lose fluid, children have less-developed sweat glands than do adults. They thus produce less sweat than adults. Because sweating is an important means of cooling the body, children are more likely to become overheated and suffer heat stress.
Because children have less muscular development than adults, they are less able to generate heat through muscular activity.

Because of the above three factors, children are more prone to dehydration and extremes of temperature (both hot and cold) than are adults. Therefore, children should not exercise for long periods of time (more than 30 minutes) in any extremes of weather conditions. They should be encouraged to drink small amounts of water frequently to replace any lost fluids, and to wear appropriate clothing.

**practical application**

**Children and young athletes**

**Construct** an original game for children to participate in that is active, fun and safe and takes into consideration their physical needs.

### Appropriateness of resistance training

The best exercises for developing strength in children are those where they lift their own body weight. It is acceptable to use resistance training (using light weights and large numbers of repetitions), as long as it is closely supervised and correct technique is taught. Maximum lifting should be avoided because it can injure growth plates. Ensure there is an adequate warm-up. Resistance training sessions should be appropriately prepared and should focus on the development of skills and fitness, but without over-exertion.

### Critical inquiry

**Assess** whether the health and social needs of young performers are met by sporting organisations.

### Research and Review

1. **Research** a number of common injuries among children.
   - **Examine** risk factors for these injuries.
   - **Suggest** suitable methods to reduce the occurrence of such injuries.
   - **Outline** current treatment strategies for each injury.

2. **Discuss** the role of a coach in determining who should do what exercises, play in certain positions or play particular sports.

3. **Describe** the benefits children derive from participation in physical activity.

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**Adult and aged athletes**

The benefits of regular physical activity are evident throughout life, whether one is a junior netball player, a teenage swimming sensation, a 30-year-old sprinter or a 65-year-old ‘golden oldie’ rugby player. This section deals with adults of 30 years of age or more.

Important consideration must be given to the reasons for adults and older people continuing to play sports and maintain physical activity. Medical conditions associated with ageing also need to be considered, including coronary heart disease, high blood pressure, cancers, mental disorders, osteoarthritis (deterioration of joints), osteoporosis (brittle bones) and vision and hearing problems. These can reduce physical activity, and a reduction in physical activity complicates the normal process of ageing.

As a result of the ageing process, the ability to function efficiently decreases. This decrease might be due to disuse, medical conditions or simply ‘wear and tear’ on the body. Exercise programs aimed at developing strength, aerobic capacity, flexibility and coordination can improve the ability to function efficiently. This might not make people live longer, but it improves their quality of life and independence. Table 17.1 shows the physical changes that occur as a result of ageing, and suggests the benefits of exercise to the aged.

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**Masters (sometimes known as veterans) is a participation category for older athletes.**

![Olympic swimming champion Dawn Fraser continues her career at masters’ titles](image)

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**Figure 17.4** Olympic swimming champion Dawn Fraser continues her career at masters’ titles
### Table 17.1  Physical changes of ageing that are affected by exercise

<table>
<thead>
<tr>
<th>System</th>
<th>Ageing change</th>
<th>Effects of exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle</td>
<td>Loss of mass and strength</td>
<td>Losses can be minimised with exercise</td>
</tr>
<tr>
<td></td>
<td>Decreased power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased endurance</td>
<td></td>
</tr>
<tr>
<td>Bone</td>
<td>Decreased total body calcium</td>
<td>Regular exercise and good diet will decrease bone loss</td>
</tr>
<tr>
<td></td>
<td>Loss of mineral content</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased brittleness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased mass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Faster calcium loss in post-menopausal women</td>
<td></td>
</tr>
<tr>
<td>Cartilage</td>
<td>Loss of elasticity (greatest loss in hip, knee, ankle and spinal areas)</td>
<td>Impact can worsen osteoarthritis</td>
</tr>
<tr>
<td></td>
<td>Increased osteoarthritis</td>
<td>Weight-bearing exercises can slow changes</td>
</tr>
<tr>
<td>Ligaments and tendons</td>
<td>Loss of elasticity</td>
<td>Stretching before and after activity will maintain flexibility</td>
</tr>
<tr>
<td></td>
<td>Increased incidence of sprains and strains</td>
<td>Regular use will maintain suppleness and strength</td>
</tr>
<tr>
<td></td>
<td>Decreased flexibility and range of motion</td>
<td></td>
</tr>
<tr>
<td>Nervous</td>
<td>Decreased nerve conduction (function) velocity</td>
<td>Reaction time and speed can be maintained by use</td>
</tr>
<tr>
<td></td>
<td>Decreased number of neurons and axons (cells in the nervous system)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased reaction time and speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss of vision and hearing</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Lower max VO2</td>
<td>Exercise can:</td>
</tr>
<tr>
<td></td>
<td>Less aerobic endurance</td>
<td>• maintain max VO2</td>
</tr>
<tr>
<td></td>
<td>Less anaerobic endurance</td>
<td>• stop endurance loss</td>
</tr>
<tr>
<td></td>
<td>Decreased maximum heart rate and cardiac output</td>
<td>• slow decrease in maximum heart rate</td>
</tr>
<tr>
<td></td>
<td>Decreased heart strength</td>
<td>• decrease risk of cardiovascular disease</td>
</tr>
<tr>
<td></td>
<td>Increased vascular resistance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased risk of coronary heart disease</td>
<td></td>
</tr>
<tr>
<td>Respiratory</td>
<td>Decreased maximal lung capacity</td>
<td>Regular exercise will reduce changes</td>
</tr>
<tr>
<td></td>
<td>Decreased air flow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decreased elasticity of lungs and chest wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increased effort to breathe</td>
<td></td>
</tr>
</tbody>
</table>


The goals of an exercise program for an older athlete should be to improve quality of life by increasing the person’s aerobic endurance, strength, energy levels, balance and coordination and flexibility and assist in weight maintenance. The side-benefits are equally as important as the physical improvements. These side-benefits include improved self-esteem, independence and sleep patterns and greater social interaction and enjoyment.

The Australian Government, in conjunction with Sports Medicine Australia, in 2005 produced a document entitled ‘Choose Health: Be Active’ that is a physical activity guide for older Australians. Recommended activities can be viewed in Table 17.2 (page 306).

Cardiac output is the volume of blood that is pumped out of the heart per minute.

Vascular resistance is the resistance to flow that needs to be overcome to push blood around the body.

### Table 17.2  Examples of suitable activities and exercise for adult and aged people

<table>
<thead>
<tr>
<th>What sort of activity should I be doing?</th>
<th>Some ideas to keep you moving</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Four types of activity are needed to keep you healthy.</strong></td>
<td><strong>Try to include at least one activity from each group.</strong></td>
</tr>
</tbody>
</table>
| **Moderate fitness activities** | • Brisk walking  
• Continuous swimming  
• Golf (no cart!)  
• Aerobics  
• Cycling  
• Washing the car  
• Walking the dog  
• Yard and garden work  
• Tennis  
• Water aerobics  
• Dancing  
• Mopping and vacuuming  |
| These activities help to keep your heart, lungs and blood vessels healthy.  
You should aim to do 30 minutes of activity from this group on most days. This can be in three lots of 10 minutes or two lots of 15 minutes. If you are just starting out, as little as 10 minutes helps! | |
| **Strength activities** | • Weight, strength or resistance training exercises  
• Lifting and carrying (e.g. groceries or small children)  
• Climbing stairs (instead of taking the lift or escalator)  
• Moderate yard work (e.g. digging and shifting soil)  
• Calisthenics (e.g. push-ups and sit-ups) |
| These activities help your muscles and bones stay strong and make it easier for you to do daily tasks as you get older.  
Make a time to do specific strength exercises two or three times a week, and build some of them into your everyday activities. | |
| **Flexibility activities** | • Tai chi  
• Bowls (indoor and outdoor)  
• Mopping, vacuuming  
• Stretching exercises  
• Yoga  
• Dancing  
• Gardening |
| These activities help you to move more easily.  
They include gentle reaching, bending and stretching. If you stay flexible you will always be able to put on your own shoes and socks.  
Try to do some form of stretching every day—even if it is only while you are watching TV. | |
| **Balancing activities** | • Heel raises  
• Standing on one foot |
| These activities will improve your balance and help to prevent falls. Make a specific time each day to do these exercises, or fit them in whenever you can (e.g. while waiting for the kettle to boil) | |

If you can, also try to reduce the time you spend sitting for long periods.  

Adapted from ‘Choose Health: Be Active—A Physical Activity Guide for Older Australians’, Dept of Veterans’ Affairs, Dept of Health and Ageing, Sports Medicine Australia

### Heart conditions

As we age, our cardiovascular system becomes less efficient and this leads to a decrease ability to carry oxygen. Problems associated with this process can include a weaker heart, narrowed and less elastic blood vessels, and high blood pressure. The lungs are also less elastic, which makes breathing harder.

Participants in aerobic events are therefore those most affected by heart problems. Older athletes should avoid strenuous exercise and should exercise at approximately 60–75 per cent of their maximum heart rate. Older athletes become fatigued more easily, and take longer to recover, to travel over set distances and to perform tasks. Adequate time and consideration must be given when coaching. A wide variety of physical activities are suitable as they do not place excessive stress on the cardiovascular system. They include walking, cycling, golf and bowls.

### Fractures and bone density

Bones that are more brittle and less dense will fracture more easily as a result of falls, impact from other people or objects or even sudden muscle contractions. Stress fractures are also common among athletes with reduced calcium, especially those women who are amenorrhoeic or have low oestrogen levels. Particular care should be taken with older females in avoiding contact sports and situations that involve sudden changes in direction. Bone development relies on physical activity, thus strength training (resistance training) should be an important consideration.
Flexibility and joint mobility

Flexibility decreases with age because of a loss in elasticity of tendons, ligaments and muscles. Effort should be made to keep joints supple and flexible so that the full range of motion is possible and so that tasks can be performed efficiently and effectively. Regular, gentle and slow stretching can achieve this. Participation in activities such as yoga and tai chi can also assist in maintaining flexibility. Swimming or exercise in an aquatic environment, such as aqua aerobics, is ideal for maintaining joint mobility. It also allows light stretching to be done in a non-weight-bearing environment. It is important for older athletes to maintain flexibility to assist with being mobile.

Figure 17.5  Aqua aerobics is ideal for maintaining joint mobility

Critical inquiry

1. Explore the physical activity options that are available for older people in your local community.
   a. Create a table summarising these options.
   b. Assess the suitability of these options.
   c. Outline the activity opportunities that exist for older people with medical conditions.

practical application

Adult and aged athletes

1. Construct an email that could be sent to your local council suggesting some suitable physical activity options for older people.

2. Apply the FITT principle (frequency, intensity, time and type) for an older athlete who wants to begin an exercise program.

3. Describe the special exercise guidelines you would suggest for an older athlete.

Research and Review

1. Describe the benefits of physical activity for older people.

2. Outline the types of exercise considered suitable for older people.

3. Identify which sporting organisations in New South Wales offer opportunities for ‘masters’ participation.
Female athletes

It has taken thousands of years for the strength, power and competitiveness of female athletes to be acknowledged. Female athletes have come a long way: from total exclusion in the times of the ancient Olympics, to passive spectators in the early modern Olympics, and then to athletes (such as Jana Rawlinson, Lauren Jackson and Emma Snowsill) competing in the Olympics of today.

Participation in sport can achieve for women the same physiological, psychological and social benefits as for men. Much research over the years has focused on determining the health risks associated with females competing in intensive and strenuous activities and training. It appears that some specifically female problems do exist for some elite female athletes but, in general, women can play sport at any level until they wish to give it up. The challenge for science and sports medicine is to keep women on the field, achieving to their peak physical abilities, while maintaining good health.

Eating disorders

Eating disorders and sport are often linked. This is because they share certain characteristics relating to weight control, food intake and physical activity. Because eating disorders are commonly associated with females, and because many female athletes are very concerned about their food intake and weight control, it is not surprising that questions have arisen about the possible relationship between eating disorders and physical activity.

In industrialised societies, the incidence of eating disorders (such as anorexia nervosa and bulimia) has increased remarkably. Approximately 5 per cent of women in these societies can be expected to develop an eating disorder at some stage in their lives. Many factors are thought to be involved in causing eating disorders. It appears that high-level physical activity can be a risk factor for eating disorders only if other predisposing factors exist; for example, poor self-esteem. It seems that the eating disorder is more likely to cause extreme exercise, rather than the other way around. Extreme exercise actually becomes a symptom of disordered eating, with exercise being undertaken only for the purpose of burning off fat, and for no other purpose. For some women, extreme exercise is a way of dealing with conscious or unconscious emotional conflicts, just as others may engage in extreme gambling or excessive alcohol consumption for the same reason.

Disordered eating leads to starvation and dehydration, both of which impair performance. Recognition and attention by loved ones and treatment by professionals, such as psychologists and nutritionists, is the best way to help female athletes who have eating disorders. Awareness of signs and symptoms is essential, and a multidisciplinary approach is necessary to treat the condition.

Anorexia nervosa is common among elite female athletes, particularly in those involved with ‘appearance’ sports (such as gymnastics, diving, ice skating and body building) and endurance sports (such as long-distance swimming, running and triathlon).

Iron deficiency

Iron is an important nutrient for the body and for good health. The amount of iron needed depends on the person’s age, gender and activity level. For example, iron needs increase during periods of rapid growth (such as during pregnancy, childhood and adolescence), which is when new tissue is being built. Females need twice as much iron as males. This difference is mainly due to blood loss during menstruation; iron is a major constituent of blood. Female athletes also need more iron during training. Iron is also lost from the mother to her foetus during pregnancy.

A lack of iron (iron deficiency) is common in females, including athletes. (Iron deficiency also exists in males, but is much rarer than in females.) Iron is needed in the blood to carry oxygen and carbon dioxide, and in important muscular and energy-producing chemical reactions. Symptoms of low iron include lethargy, weakness and fatigue. A person with iron deficiency might describe a feeling of being ‘washed-out’. (Anorexia nervosa is also a problem for men in weight-classification sports, such as wrestling, boxing and horse-racing.)
Iron deficiency can result in anaemia (low blood count). Iron deficiency, even without anaemia, leads to a reduced rate of lactate clearance, which is the removal of the waste product lactic acid from muscle. The slower lactate clearance rate causes early fatigue. So it is clear that iron deficiency can affect athletic performance and training levels, which means it is important for the female athlete to be aware of this important mineral and maintain correct intake.

The recommended daily intake (RDI) of iron for adult females (aged 19–50 years) is 18 milligrams. (The RDI of iron for adult males is 8 milligrams.) All athletes should be encouraged to consume iron-rich foods. Good sources of iron are:

- meat, seafood and poultry
- legumes and nuts
- whole grains and cereals
- dark green, leafy vegetables
- eggs.

Iron absorption is best achieved from foods that contain haem iron. Red meat and meat alternatives (such as poultry and fish) are the best sources of haem iron. Iron absorption from foods that contain non-haem iron is much lower. Non-haem iron is mainly found in plant foods, such as cereals, vegetables, legumes and nuts. Iron absorption is improved when a source of vitamin C is consumed with the meal containing an iron source.

Bone density

Bone density refers to the thickness and strength of bones. Calcium deficiency is associated with osteoporosis and bone fractures in older females. Calcium is necessary for bone strength, and is also required in the blood to allow muscles and nerves to function correctly. Causes of calcium deficiency in bones include the hormonal changes associated with menopause (cessation of menstrual period), decreased exercise and inadequate amounts of calcium in the diet. Athletes with amenorrhea (cessation of menstruation when of reproductive age) are also prone to calcium deficiency because of decreased calcium intake or lower oestrogen levels—or both.

Nutritionists recommend that people of all ages should have an adequate calcium intake. The RDI of calcium for females and males (19–50 years) is 1000 milligrams, which would require consumption of at least two serves of calcium-rich food each day. After menopause, the RDI for women (aged 51 years and over) is 1300 milligrams.

Good sources of calcium are:

- milk
- cheese
- yoghurt
- fruit and vegetables (especially green leafy varieties)
- fish with bones (such as sardines).

Adequate calcium intake is essential for maintaining bone density. Athletes need to be mindful of maintaining adequate calcium levels so as not to affect bone density, which may lead to increased risk of injury. Children who do not have a sufficient intake of calcium during growth develop smaller bones with reduced amounts of calcium, and are more likely to develop osteoporosis as adults. Regular exercise—of a light to moderate intensity—is recommended for young females (children through to teenagers) as a means of decreasing the risk of osteoporosis in later life. Oestrogen is also very effective in maintaining bone density. In fact, oestrogen is more effective than increased dietary calcium in this regard. Low bone density is associated with amenorrhoea.

Pregnancy

Mild to moderate exercise is safe and beneficial for pregnant women. Many elite athletes have trained and performed at various stages throughout and after pregnancy with no apparent problems. Some have even performed better postpartum (after giving birth). Jana Rawlinson, for example, won the gold medal in the 400-metre hurdles at the 2007 World Athletics Championships just eight months after giving birth. Rawlinson trained throughout her pregnancy.


Figure 17.7 Iron absorption is best achieved from foods that contain haem iron.
Exercise is contraindicated (that is, considered dangerous) in high-risk pregnancies; for example, for women who have experienced a miscarriage, a multiple pregnancy, premature labour or high blood pressure.

The following basic training guidelines should be followed by pregnant athletes:

- Do not start a new exercise program during pregnancy.
- Avoid vigorous exercise.
- Decrease exercise intensity as pregnancy progresses. It is widely recommended to maintain heart rate levels at no more than 140 beats per minute (bpm), but some athletes may be able to sustain 150–160 bpm as long as no ill-effects are felt.
- Avoid contact and collision sports and scuba diving, parachuting, water skiing and gymnastics.
- Avoid overheating and heat stress (such as may be experienced in saunas and poorly ventilated areas and during hot or humid weather).
- Thoroughly warm up and cool down—exercise gradually.
- Maintain adequate hydration.
- Advise the doctor of the intention to exercise.
- Be aware of the signs to stop exercising (for example, pain, bleeding, nausea or headaches).

**Research and Review**

1. **Identify** at what stages during pregnancy women can exercise or play sport.
2. **Outline** what types of exercise or sport would be suitable for pregnant women.
3. **Discuss** why it is important to assess the physical, psychological and social needs of all athletes.
4. **Suggest** some of the myths associated with women competing in sports.
5. **Research** the conditions that result from inadequate dietary consumption of iron (iron deficiency and anaemia) and calcium (osteoporosis) to determine the following for each condition:
   - a concise description
   - signs and symptoms
   - preventative strategies.
Children with medical conditions such as asthma, diabetes and epilepsy should engage in physical activity and sport due to its many benefits, but should inform their coach of their condition. Children should stretch, wear correct footwear, undertake conditioning programs and avoid overtraining to avoid the risk of overuse injuries. Children are more prone to extreme temperatures than are adults and should not exercise for excessive time periods and in extreme conditions. Adequate fluids should be drunk and appropriate clothing for the conditions worn. Resistance training in children and young athletes is acceptable if they are supervised for correct technique and use light weights and low repetitions. Exercise for adult and aged athletes provides many positive benefits. Medical conditions associated with ageing need to be considered when participating. Exercise duration, intensity and type need to be examined for suitability. Exercise options for adult and aged athletes with medical conditions include swimming, aqua aerobics, walking, yoga, stretch classes and golf. Eating disorders, iron deficiency and poor bone density are conditions that can affect female athletes and impede performance. Athletes need to be mindful of nutritional requirements, particularly in meeting the RDI of iron and calcium. Exercise during pregnancy is safe and beneficial as long as there is monitoring of basic guidelines concerning exercise intensity, type of exercise chosen and environment in which the exercise occurs.

**Chapter summary**

- Children with medical conditions such as asthma, diabetes and epilepsy should engage in physical activity and sport due to its many benefits, but should inform their coach of their condition.
- Children should stretch, wear correct footwear, undertake conditioning programs and avoid overtraining to avoid the risk of overuse injuries.
- Children are more prone to extreme temperatures than are adults and should not exercise for excessive time periods and in extreme conditions. Adequate fluids should be drunk and appropriate clothing for the conditions worn.
- Resistance training in children and young athletes is acceptable if they are supervised for correct technique and use light weights and low repetitions.
- Exercise for adult and aged athletes provides many positive benefits. Medical conditions associated with ageing need to be considered when participating. Exercise duration, intensity and type need to be examined for suitability.
- Exercise options for adult and aged athletes with medical conditions include swimming, aqua aerobics, walking, yoga, stretch classes and golf.
- Eating disorders, iron deficiency and poor bone density are conditions that can affect female athletes and impede performance. Athletes need to be mindful of nutritional requirements, particularly in meeting the RDI of iron and calcium.
- Exercise during pregnancy is safe and beneficial as long as there is monitoring of basic guidelines concerning exercise intensity, type of exercise chosen and environment in which the exercise occurs.

**Revision activities**

1. **Outline** how exercise can be made both fun and safe and thus beneficial to the well-being of children.
2. **Assess** the appropriateness of resistance training for children and young athletes.
3. **Justify** the need for good nutritional practices for female athletes.
4. **Discuss** the impact that medical conditions such as heart conditions, poor bone density and joint immobility may have on exercise options for the adult and aged athlete.

**Extension activities**

1. **a** Conduct a literature review examining the appropriateness of resistance training for children and young athletes.
2. **b** Justify your thoughts on the issue.
3. **Construct** a fact file that could be given to a sports coach outlining the medical conditions of asthma, epilepsy and diabetes. Include a brief overview of the condition, the implications for participation in sport, preventative techniques and management procedures.
4. **Construct** a brochure, pamphlet or booklet that outlines the benefits of exercise for pregnant women and the guidelines for exercise that they should undertake. The publication should be created using Publisher or a similar program and be suitable for distribution in medical facilities or insertion in parenting magazines.

**Exam-style questions**

1. **Discuss** how medical conditions such as asthma, diabetes and epilepsy need to be managed so that young people can engage in sport and physical activity safely. (8 marks)
2. **Analyse** the impact of thermoregulation for children and young athletes participating in sport. (12 marks)
3. **Describe** the sport participation options that are available for aged people with medical conditions. (8 marks)
4. **Assess** the impact of iron deficiency and bone density on the participation of females in sport. (12 marks)