INQUIRY QUESTION
If you were the coach of the Australian Soccer Team, how would you design the team’s training program and what strategies would you use to record each player’s physiological, psychological and sociological responses to the training program that you design?
The ultimate purpose of designing, planning and implementing a training program is to achieve specific chronic adaptations that will enable an athlete to perform the best they can in their chosen sport or activity. This chapter investigates the important aspects that need to be considered in the overall planning of an effective training program, including the components of a discrete exercise training session, and monitoring and recording of physiological, psychological and sociological training data.

**KEY KNOWLEDGE**
- Strategies to monitor and record physiological, psychological and sociological training data, including training diaries and digital activity trackers and apps
- Components of an exercise training session including warm-up, conditioning phase and cool-down

**KEY SKILLS**
- Explain the importance of maintaining physiological, psychological and sociological records of training
- Conduct and participate in all components of an exercise training session
- Reflect on the physiological, psychological and sociological aspects of participation in a variety of training sessions
- Analyse training data to identify appropriate modifications to a training program

**CHAPTER PREVIEW**

- Monitoring and planning a training program
- The design of a training program
- Designing a training session
- Strategies to monitor and record training: physiological, psychological and sociological
- Training program steps
  - Periodisation — phases, peaking and tapering
  - Training program planner
- Warm-up
  - Conditioning phase
  - Cool-down
- Training diaries
  - Digital activity trackers
  - Applications (apps)
To maximise the benefits of a training program, it is essential that it be well designed. There are a number of important steps that should be undertaken when planning and implementing a training program.

**Planning a training program**

Devising and implementing a training program requires a carefully considered, step-by-step approach in which the coach and/or athlete incorporates the activity analysis, fitness assessment, training principles, training methodology and session-by-session detail into an overall plan.

**FIGURE 10.1** Summary of the steps involved in planning a training program

**Step 1**
Determine:
- Energy systems
- Fitness components
- Major muscle groups
- Fatiguing factors

**Step 2**
Identify the strengths and weaknesses of the athlete.
Consider the aims and protocols and also the reliability and validity of each test. Undertake a prehealth screening (PAR-Q) and obtain informed consent.

**Step 3**
Include the important training principles such as:
- Frequency, intensity, time, type, progression, specificity, individuality, diminishing returns, variety, maintenance, overtraining and detraining.

**Step 4**
Apply the relevant training principles.

**Step 5**
Monitor and record physiological, psychological and sociological training data with the use of training diaries, digital activity trackers and apps.

Data collection and activity analysis

Skill frequencies, movement patterns, heart rates and work-to-rest ratios

Assessment of fitness

Utilise a range of suitable tests that have been selected based on the important physiological components identified in the activity analysis. Identify the aims and objectives from physiological, psychological and sociocultural perspectives.

Plan overall training program

Select appropriate training methods including:
- Continuous, interval (short, intermediate, long and high intensity), fartlek, circuit, weight/resistance, flexibility and plyometrics.

Design each specific training session

Include the important components:
- Warm-up conditioning phase cool-down.

Monitor and record training

Adjust the training program as necessary, based on the feedback received from monitoring training.
In order to develop the most effective training program for achieving the desired chronic adaptations and improving the physiological capacity of an athlete and their performance, there are important steps that should be undertaken. Figure 10.1 provides a summary of these steps.

When designing a training program, all steps should be considered and then implemented in order for the program to be successful.

**Activity analysis**
Collect data in order to undertake an activity analysis to determine the relevant energy systems, fitness components, muscle groups and the associated fatiguing factors required by the activity or sport (see chapter 7 for more detail about conducting an activity analysis). The actual training program must be specifically designed to develop the physiological capacity of the athlete to meet these requirements.

**Assessment of fitness**
Carry out a pre-fitness assessment using a range of suitable fitness tests that have been selected based on the results of the activity analysis (see chapter 9 for more detail about conducting a fitness assessment). This pre-fitness assessment enables the athlete's strengths and weaknesses to be identified, and also determines a suitable starting point (baseline) in terms of training workloads.

**Training methods and principles**
Select the appropriate training methods to be incorporated into the training program based on the findings of the activity analysis and the results of the pre-fitness assessment battery. Incorporate the correct application of the important training principles to each of the training methods selected (refer to chapter 11).

**FIGURE 10.2** All training sessions require careful planning.
Periodisation of the training program

The ultimate success of a training program is dependent upon the appropriate application of the concept of periodisation. Periodisation is simply a process of dividing the annual training plan into a series of manageable phases, with each phase designed to target a specific goal to be developed within a designated period of time. You will study the concept of periodisation in more detail later in this chapter, and develop a greater understanding of the following aspects: training phases, tapering and peaking.

Training program matrix or planner

Before implementing a training program it is important to develop an overall training program matrix or planner that incorporates all of the training methods and sessions that are to be applied. It is crucial that the process of developing a training program planner begins with identifying and setting specific dates for achieving competition or personal goals. These dates form the basis for assigning the specific training phases. The general preparatory phase develops a fitness foundation for the pre-competition phase, which incorporates work of increasing intensity. The athlete’s aim is to reach their peak fitness in readiness for the competition phase and this will include preceding tapering periods. The transition phase is the essential link between the end of the competition phase and the beginning of the preparatory phase and provides the athlete with an opportunity for physiological and psychological recovery by reducing the training load.

Specific training sessions

For each method of training that will be incorporated into the overall program, it is necessary to determine the total number of training sessions to be undertaken per week and over the duration of the program. This then allows you to plan the content of each training session in terms of training method, activities to be performed, intensity, volume and duration. When planning the specifics of each training session, adherence to the principles of training, especially specificity, intensity and progressive overload, must be considered and applied appropriately.

To obtain maximum benefit from each training session, it is also necessary to carefully consider how it is structured. Basically, all training sessions should consist of a warm-up, a conditioning component, a cool-down and stretch. More specific detail about the format of a training session will be provided later in this chapter.

TEST your understanding

1. Outline the key steps that need to be addressed when designing a training program.
2. Explain why it is important for a training program to be carefully planned.
3. Define the concept of periodisation.
4. List the three main training program phases.
5. Identify the three main components that comprise a specific training session.

APPLY your understanding

6. Discuss the importance of undertaking Step 1 (Data collection/activity analysis) as a part of the training program design process.
7. Explain the purpose of completing Step 2 (Assessment of fitness).
8. For a sport of your choice, design a 12-month training plan that shows when each of the training phases would take place.
9. Develop an individual training session template that would suit the sport of your choice.
Soccer is one of the most popular sports in the world today. A game of soccer consists of two 45 minute halves. Mathew Ryan is a goal keeper and Massimo Luongo is a midfielder for the Australian ‘Socceroos’.

**A goal keeper’s role** is mainly defensive and involves staying in the penalty area environs to prevent the opposition from scoring a goal. Most of a goal keeper’s movements involve short sprints, kicking, throwing, leaping and jumping with frequent rests periods between work bouts.

**A midfielder’s role** involves offensive and defensive plays. A midfielder covers far more of the playing field with extended movement patterns involving sprinting, cruising, jogging and walking, in addition to kicking, dribbling and heading the ball with far less rest periods than a goal keeper.

(a) With reference to the game of soccer; discuss why it is important to conduct an activity analysis prior to designing a training program. **4 marks**

(b) Identify the purpose of conducting fitness testing on Ryan and Luongo. **1 mark**

(c) Outline why Ryan and Luongo’s coach would develop a training planner or matrix. **2 marks**
10.2 Periodisation of training

**KEY CONCEPT** An extended training program is typically separated into three phases or periods: the preparatory phase, the competition phase and the transition phase.

Training program plans will differ according to the specifics of the sport. Some sports will have a number of different competition phases interspersed throughout a 12-month period, some will have only one major competition as the main focus in order to peak, and for others there will be weekly matches within the defined competition phase. Typically, a traditional or linear periodisation model involves the training program plan being divided into the following three phases which may be manipulated according to the specific requirements of a particular sport or activity.

1. Preparatory phase (pre-season)
2. Competitive phase (in-season)
3. Transition phase (off-season)

Within each of the three phases, the athlete will train to accomplish certain goals. There will be a shift from an emphasis of high volume and low intensity in the preparatory phase to an emphasis of low volume and high intensity as the competition phase nears.

### Preparatory phase

The preparatory phase of training is commonly referred to as the pre-season or conditioning phase of training. It usually lasts 2–4 months and is arguably the most important phase in an overall training program plan. In this phase of training the major objective is to provide a suitable fitness and skill base for the competition phase. It forms the foundation for all subsequent training to be built on.

The preparatory phase can be further divided into two sub-phases based upon the characteristics of training:

1. **The general preparatory sub-phase.** This sub-phase is concerned with obtaining a general fitness base and developing the main physiological requirements of the athlete's sport or activity. Strength building exercises are introduced during this phase. Emphasis is placed on maximising the capacities of the relevant energy systems, particularly the aerobic energy system. Fitness testing and specific skill correction are also a common focus of this period of training. The volume of training is generally high, but the intensity is low to begin with, slowly increasing as the phase progresses. This sub-phase usually lasts 4–10 weeks.

2. **The specific preparatory sub-phase.** As the competition phase approaches, there is a shift in training towards more specific game-related training. There should be a gradual reduction in the volume of training as the intensity starts to progressively increase. A greater amount of variety is also introduced into the training program during this sub-phase and it usually lasts 2–6 weeks.

### Competition phase

The competition phase is preceded by a short pre-competition phase so that by the time the competition phase, or in-season phase, of training begins, the athlete should have achieved optimal fitness and skill levels. The focus of the pre-competition phase is to ensure that the athlete is at their peak fitness for competition. This is where an athlete continues to increase the intensity of their training and adjust the volume appropriately. This sub-phase may also incorporate practice matches and tactical training in readiness for competition. A taper period to allow the athlete to recover and reduce any residual fatigue for subsequent competition is often included towards the end of this sub-phase. The emphasis of the competition phase of training should be on maintaining these attributes, and further developing and refining strategies, tactics and game plans.
Because of the demands of competition, particularly if games are weekly (as is the case with many sports such as football, basketball and netball), training needs to be planned carefully. This is to allow for recovery and to ensure that players are at their peak both physiologically and psychologically on game day. Individual training sessions in the day or two after competition should allow for adequate recovery. Subsequent sessions early in the week should be relatively longer and/or more intense. Sessions towards the end of the week should be shorter and less intense, so that players are fully recovered by the day of competition.

The competition phase usually lasts 4–6 months for most sports played at an elite level.

**Transition phase**

The transition phase (off-season phase) is designed to provide the athlete with both a physiological and psychological respite from the rigours of competition and training. The key to the transition phase of training is to create a balance between recovery and maintenance of training. It is imperative that adaptations do not reverse to pre-training levels during this phase. This phase should begin with a short period of active rest and little formal training. Thereafter, the aim during this phase should be for the athlete to remain reasonably active through involvement in a range of recreational activities and low-intensity training to maintain a suitable level of fitness. Cross-training provides variety and is a good way to allow for active recovery both physiologically and psychologically while preserving a base level of fitness. It is essential that the athlete’s diet is carefully monitored during this period of time. The off-season phase usually lasts for 6–12 weeks.
### 10.2 Periodisation of training

Another form of periodisation that has become popular is block or nonlinear periodisation which incorporates blocks of highly specific and concentrated periods of work with more frequent variations in load. Each sport will differ in the way that a block or nonlinear periodisation model is designed, however some general principles apply.

- Each training block focuses on a small number of targeted fitness components and/or skills.
- The length of each training block is typically 2–14 weeks as this period of time allows for chronic adaptations to occur without too much corresponding fatigue.
- There are only a small number of blocks that are generally incorporated into an overall training program.
- Each training block is sequenced consecutively in order to achieve optimal performance for competition.
- Variations in the levels of imposed stress stimulate more rapid adaptations.
- Allows for an athlete to prepare for multiple events throughout the year.

One of the main differences between the traditional or linear and block periodisation models is that traditional or linear periodisation aims to improve a variety of fitness components and skills simultaneously over a longer period of time, whereas block or nonlinear periodisation is more specialised and concentrated in its approach to each work block.

#### Peaking and tapering

The main goal of a training program is to prepare an athlete to be able to perform at their best, however it is generally possible for an athlete to remain at their optimum level of performance all year round. Hence, athletes often aim to be at their best performance state for particular competitions. The nature of the sport determines when the athlete needs to be performing at their optimum. A triathlete may aim to be at his or her best level of performance for major events such as National and World Championships, whereas an Australian Rules Football player would aim to perform at his or her best on a weekly basis; however he or she would also hope to be at optimum level of performance during finals. Each program needs to be individualised to cater for these differences and also take into account the particular athlete's overall goals.

**Peaking** refers to the planning of training so that an athlete reaches their optimum state of readiness to perform at a particular predetermined time.

**Tapering** is a reduction in training that allows the athlete time for extra recovery and for their energy stores to be fully restored.
however, these athletes still require periods of recovery in order to perform at their peak. The most prominent change that occurs as a result of effective tapering is an increase in muscular strength. Some coaches have a certain amount of apprehension in allowing their athletes to undertake a period of tapering, as they worry that it will cause a reduction in their aerobic conditioning. Research reveals that although a considerable amount of training is required for significant improvements in aerobic capacity to be achieved when starting a training program, much less training is required to maintain them and reducing the load with appropriate tapering should not cause any detraining. Every individual athlete will respond differently to tapering, however most athletes will improve or at least maintain their current level of performance.

Some of the benefits of tapering include:
- allows for replenishment of fuel substrates such as glycogen
- provides an opportunity for psychological refreshment
- heightens enzyme activity
- increases red blood cell volume
- allows for the repair of muscle micro-trauma.

Greg Wells, from the Canadian Sport Centre, summarises seven characteristics that seem to be common to successful tapering techniques.

1. Total training volume is reduced by 60–90 per cent.
2. The volume of high-intensity training remains high (high intensity is relative to the event being prepared for).
3. The level of difficulty is reduced by increasing recovery time.
4. The frequency of training is reduced slightly (up to 20 per cent).
5. The time of the taper period is between four and 21 days, depending on the individual.
6. Use a fast decay exponential taper design.
7. Activities performed during taper are specific to the athlete’s competitive demands.

A fast decay exponential taper involves reducing the training load progressively, with a greater reduction at the beginning of the taper and sustaining the low training load.

FIGURE 10.5 Matthew Dellavedova would have followed a very well-designed training program in order to be at his peak and contribute to the Australian Boomers’ success at the Rio 2016 Olympic Games. The Boomers narrowly missed a medal and came fourth after a disappointing match against Serbia.
TEST your understanding

1. Identify the role of the preparatory phase of training and make a distinction between the general and specific preparatory sub-phases.
2. Identify the role of the competitive phase of training and make a distinction between the pre-competition and competition sub-phases.
3. Identify the role of the transition phase of training and explain the types of activities that could be included during this phase.
4. Why does the athlete need to pay more attention to their diet during the transition phase?
5. Explain the difference between a traditional periodisation model and a block periodisation model.
6. Explain the relationship between peaking and tapering.

APPLY your understanding

7. Show how the volume and intensity of training is manipulated during each phase of training by completing the digital document Phases of training in your eBookPLUS.
8. Design a 12-month training program planner using a traditional or linear periodisation model that would suit a sport of your choice. Complete your planner including the following information:
   - In the Months section of the template, insert names of each month.
   - In the Competition dates section of the template, highlight when important competitions will occur.
   - Indicate your training goals for each phase; e.g. increase aerobic capacity, maintain muscular strength, etc.
   - Indicate how you would manipulate the volume and intensity of training during each phase; High, Medium or Low.
Below is an example of an Athlete’s training program planner template. Make sure that the design of your template is applicable to the sport of your choice.

<table>
<thead>
<tr>
<th>12-MONTH TRAINING PROGRAM PLANNER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Months</td>
</tr>
<tr>
<td>General preparatory</td>
</tr>
<tr>
<td>Training phase</td>
</tr>
<tr>
<td>Competition Dates</td>
</tr>
<tr>
<td>Volume</td>
</tr>
<tr>
<td>Intensity</td>
</tr>
</tbody>
</table>

H – High, M – medium, L – low

9. How would you design your training program differently using a block periodisation model?
10. For a sport of your choice, describe how you would appropriately taper the training program in order for the athlete to peak at their optimum performance for competition.
10.3 Components of an exercise training session

**KEY CONCEPT** The components of an exercise training session include the warm-up, conditioning phase (skill and fitness), cool-down and stretch.

The most important part of any training program is the actual training sessions. The specific content of each training session will depend on various factors such as the overall aim of the program and its timing within the periodisation plan. However, all training sessions should be structured to include the following:

1. a warm-up component
2. a conditioning component (skill development and/or fitness conditioning)
3. a cool-down component
4. a stretching component.

**The warm-up component**

Each training session should begin with a warm-up. Essentially the warm-up is designed to prepare the body both physiologically and psychologically for the conditioning phase of the training session. The athlete gradually increases the intensity level of physical activity performed in order to increase the heart rate, blood flow and ultimately the temperature of the muscles to be used. A warm-up provides the opportunity for the body to transition from a resting state to the higher physiological demands of the conditioning phase of training. The length and types of activities to be undertaken in a warm-up is dependent upon the intensity of the conditioning phase, the ability level, the age of the athlete and the weather conditions. Generally the harder the conditioning phase and/or the older the athlete, the more extensive the warm-up should be. The length of the warm-up should also be increased in cold weather environments. The warm-up should produce mild sweating without any feelings of fatigue and should consist of movements that mimic the muscle actions required in the conditioning phase of the training session.

**FIGURE 10.6** An effective warm-up was a crucial part of Sharni Layton’s preparation in this Constellation Cup match against the New Zealand Silver Ferns.
The phases of a warm-up

An effective warm-up prepares the respiratory, cardiovascular and muscular systems to be at their optimum readiness for subsequent activity and generally consists of the following phases.

- **General phase** — low- to moderate-intensity cardiovascular continuous whole-body cyclic exercise such as jogging, swimming or cycling to begin to increase the heart rate and blood flow to the muscles. This phase should be about 5–10 minutes in length.

- **Dynamic range of movement phase** — dynamic range of movement exercises (dynamic stretching) such as leg kicks, side swings, lunges, trunk rotations etc. appropriately selected to target the specific muscles and joints to be used in the conditioning phase. The aim of this phase is to loosen and increase the mobility of the joints, muscles and connective tissue.

- **Sport/activity specific phase** — activities that involve agility, speed, acceleration and sport/activity specific skills are included in this phase. This prepares the body for the intensity that is required during the conditioning phase of training and it also increases the neuromuscular efficiency and consequently the speed at which muscles are able to respond to stimuli.

The warm-up is also a good time for the athlete to increase their focus and concentration and prepare mentally for subsequent performance.

It is important to note that while research has found that a warm-up results in many benefits to performance, it may also be detrimental to performance if it causes the core body temperature to increase two degrees above the normal range of 36.5–37.5 degrees Celsius. The optimal combination of intensity, duration and type of activity to be included in the warm-up is very individualised, however the time between the conclusion of the warm-up and the start of the event or conditioning phase should be less than 15 minutes.

The ultimate aim of the warm-up is the same for every athlete: to be ready to participate 100% in an event, competition or the conditioning phase of training.

**FIGURE 10.7** The Australian hockey team complete a dynamic warm-up prior to their international match.
The benefits of a warm-up

The warm-up prepares an athlete both physiologically and psychologically for the remainder of the training session. It produces changes such as:

- increased blood flow to the muscles, resulting in an increase in muscle temperature and muscle fibre elasticity and therefore allows the muscles to contract more forcefully and relax more quickly. This permits the joints to work at their full range of movement and lessens the likelihood of injury.
- increased heart rate and dilation of blood vessels, which results in a greater oxygen and nutrient delivery to the muscle cells.
- increased enzyme activity within the muscle cells due to increased muscle temperature, facilitating faster fuel breakdown and energy release within the muscle.
- increased respiratory rate and pulmonary diffusion, resulting in increased delivery of oxygen to working muscles.
- enhanced neural pathways, resulting in an increased rate, speed and strength of nerve impulses, allowing for more forceful muscular contractions.
- increased availability of oxygen in the contracting muscle, which reduces the size of the oxygen deficit in subsequent higher-intensity activity.

The conditioning component

The conditioning component is the main focus of the training session and it may include a skill development phase and/or a fitness conditioning phase. The nature of the sport, activity or event will determine the percentage allocation of the skill and the fitness conditioning required. In sports such as golf that require a high level of skill and a lesser fitness conditioning need, there will be a greater emphasis on the skill development phase. In sports like triathlons, the fitness conditioning phase will have a greater emphasis in most sessions. In some sports, there is an equal need for both skill development and fitness conditioning and this needs to be balanced accordingly.

The conditioning component will include the application of specific training methods (discussed in chapter 11) that have been selected based upon the data/activity analysis. It is during the conditioning component of the training session that the focus is to improve the relevant fitness components, muscle groups, energy systems and motor skills required in the chosen sport, activity or event. The important training principles (discussed later in chapter 11) should be applied appropriately during each session.

Skill development phase

Activities designed to provide practice of skills, game plans, tactics and strategies are incorporated into the skill development phase of the training session. The skill development component can either precede or follow the fitness conditioning phase. If these activities are performed prior to the fitness conditioning phase, the athletes are generally less fatigued, more alert and better able to focus. However, the coach may want the athletes to practise skills while experiencing fatigue, as would be the case in a game. Therefore, they may schedule these activities to take place after the fitness-oriented work of the fitness conditioning phase. Of course, skill-related activities might also be incorporated into the conditioning phase.
10.3 Components of an exercise training session

**Fitness conditioning phase**

The primary objective of the **fitness conditioning phase** of the training session is the development and/or maintenance of the specific fitness components, muscle groups, energy systems and motor skills required for the particular sport or activity. To ensure optimum effectiveness, empirical evidence suggests an accepted order of priority for the development of fitness attributes.

1. Sprint and speed work should normally be undertaken first while the athlete’s fatigue levels are low.
2. Power and strength training should follow next, while fatigue levels are still relatively low.
3. Aerobic activities and the development of local muscular endurance should usually be undertaken as the final part of the conditioning phase.

**The cool down component**

In much the same way that exercise intensity must gradually increase during the warm-up, so too must it gradually decline towards the end of the training session. This gradual reduction of the intensity of the activities being performed is referred to as the **cool down** and should be of approximately the same intensity and duration as the warm-up.

The type of activities performed in the cool down should replicate the activities performed in the conditioning component so that the appropriate muscle groups are recovered effectively. An example is a cyclist who, after completing a series of sprints around the velodrome, completes a number of laps at a gradually decreasing pace. The cool down should also incorporate a series of optimal static or PNF stretches of all the major muscles used in the skill development and conditioning components of the training session. The cool down is the first stage in an athlete’s recovery process after training.

**The need for a cool down**

The major physiological rationale for completing an active cool down is to prevent venous pooling, remove metabolic waste from the muscles and reduce the likelihood of delayed onset muscle soreness (DOMS). Venous pooling refers to the accumulation of blood in the veins. After strenuous exercise, the heart continues to pump out blood forcefully and rapidly for some period of time. If an athlete ceases activity altogether at this point, their muscles are no longer contracting and helping to propel blood back to the heart (the so-called skeletal muscle pump effect). As a result, blood may pool in the veins, especially in the lower limbs. This venous pooling can result in a decreased venous return to the heart. Consequently, less blood is re-oxygenated via the lungs, and less metabolic by-products (carbon dioxide and lactic acid) are removed from the muscle tissues. The main aim of the cool down is to bring the body back to resting levels in the most efficient way possible.

**The stretching component of a cool down**

As discussed earlier, the most appropriate stretches to be used during the warm-up are ones that are dynamic in nature and consist of sport-specific, functional-based movements. Dynamic stretching involves using the momentum of the active muscle contractions to move the muscles and joints through a full range of movement. They should mimic the movements required in the specific sport, activity or event to prepare the neuromuscular system for the higher intensity movements that will follow.

At the end of the cool down component of the training session, stretching should take place in order to improve the flexibility of the muscles and reduce any stiffness or soreness. An athlete will gain the most benefit from stretching when the muscles...
are still warm and the ligaments and joints are more elastic. The type of stretches undertaken at this stage are more static in nature and may include the following:

- **Static stretching** — involves taking the joint to its full range of movement that can be comfortably tolerated and holding it for a time period (at minimum of 10 seconds). The stretch reflex relaxes muscles and maintains or increases the flexibility and range of movement of joints.

- **Passive stretching** — involves the muscle relaxing with the use of an external force assisting you to achieve the stretch.

- **Proprioceptive neuromuscular facilitation (PNF)** — involves fully lengthening the muscle and isometrically contracting against a resistance for a time period before stretching again. This process is repeated until a full stretch is achieved. This type of stretch works on the theory of reciprocal inhibition that when an agonist muscle contracts, the antagonist muscle is inhibited which causes it to relax and achieve its full range of movement.

- **Slow active stretching** — involves the contraction of the opposing muscles to assist in relaxing the targeted muscle to achieve its full range of movement. This type of stretch is generally considered low risk because it is controlled by internal rather than external forces.
10.3 Components of an exercise training session

**TEST your understanding**

1. Discuss how the warm-up prepares the athlete physiologically.
2. Discuss how the warm-up prepares the athlete psychologically.
3. Outline the three main phases that a warm-up consists of and explain the type of stretches that should be performed during the warm-up component of training.
4. Explain when a warm-up may be detrimental to performance.
5. Outline the two phases that may be included in the conditioning component of a training session.
6. Provide an example of a type of sport/activity that an athlete may prioritise a higher percentage of time allocation to undertaking skill development.
7. Describe and explain a situation in which a coach may incorporate the skill development phase prior to the fitness conditioning phase.
8. Describe and explain a situation in which a coach may incorporate the fitness conditioning phase prior to the skill development phase.
9. Explain venous pooling. Why does it occur and how does an active cool-down prevent it from happening?

**APPLY your understanding**

10. Explain the purpose of incorporating stretching at the end of a training session.
11. Design a 60-minute sample training session for a sport/activity of your choice. Your training session needs to include an appropriate selection of some example activities for each component. It should also indicate the recommended timing of each component. You should also provide information about the type, intensity, time and number of repetitions for each activity that you would recommend. Use the Example training session template in your eBookPLUS.
12. **Practical activity: <title needed>**

Put your training session into action. Become a coach and guide your peers/class through the training session that you have designed. You may need to modify the timing of each component based upon class time availability. Your teacher may also like to allocate a different training method or a particular sport/activity for each group to design and demonstrate their training session.

**EXAM practice**

(adapted from ACHPER Trial Exam 2014, question 7)

Daniel is a Year 12 student who trained to compete in an 8 km Fun Run. The race was held on a flat course that comprised 2 x 4 km laps. On the night of the race, the air temperature was 33 degrees Celsius. During the race, the following data was collected via a heart rate monitor and GPS.

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<thead>
<tr>
<th>Distance</th>
<th>Time (Minutes)</th>
<th>Average Heart Rate</th>
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<tbody>
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</tr>
<tr>
<td>2 km</td>
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<tr>
<td>8 km</td>
<td>4:13</td>
<td>180 bpm</td>
</tr>
</tbody>
</table>

(a) Discuss the benefits for Daniel in undertaking a warm-up prior to competing in the 8 km Fun Run. **3 marks**
(b) What main consideration would Daniel need to take into account when designing the conditioning component of his training sessions leading up to the event? **1 mark**
(c) Outline the purpose of the conditioning component of a training session. **2 marks**
(d) State two main reasons why you would recommend that Daniel undertake a cool down at the completion of the 8 km Fun Run. **2 marks**
10.4 Strategies to monitor and record training

KEY CONCEPT Athletes and coaches should use strategies to monitor and record their physiological, psychological and sociological training data in order to reach a peak level of performance.

Monitoring and recording strategies

There are a variety of different monitoring and recording strategies that are available for athletes to monitor and record their physiological, psychological and sociological training data. Advances in wearable technologies and applications have created the opportunity for athletes to collect data electronically and monitor their training more effectively. Training diaries, digital activity trackers and apps are very useful monitoring tools that an athlete and coach can use in order to increase the effectiveness of a training program. Monitoring training allows for a reconciliation between the aims of the program and what is actually being achieved. Monitoring training provides an understanding as to how hard an athlete is working paralleled with how well they cope physiologically, psychologically and sociologically with the training load. It is important that monitoring is used to inform, evaluate and modify training and not simply as a method of collecting data. The information provided can allow the athlete to incorporate the concepts of peaking and tapering effectively into their training program.

Over recent decades, increased physiology knowledge has had an impact on improving sports performance. This, combined with the current digital technology advancements, has meant that athletes are being more heavily monitored, further improving performance. The digital technology advancements have created an overwhelming number of digital monitoring systems that are available choose from. The choice of which to use is really dependent upon the information that the athlete and coach require. They need to ensure the information gathered has meaning when considering maintaining or modifying a training program. A combination of both subjective and objective data should be used in order to understand the whole picture of the athlete. Physiological responses may be influenced by both psychological and sociological factors. It is important that the type of data gathered is informative, relevant and useful in monitoring the aspects specific to the sport and the athlete. Data that is easily interpreted and practical in its application is more likely to support ongoing monitoring.

Coaches and athletes will often incorporate a variety of strategies to monitor training so that they can obtain a more comprehensive understanding of their physiological, psychological and sociological influences. Training diaries, digital activity trackers and application software provide a range of ways to monitor the effectiveness of a training program and minimise injury and/or illness. The ultimate goal of a training program is to achieve the necessary chronic responses to improve an athlete’s performance in a particular sport or activity and monitoring training is essential to keep the athlete on track to reaching this goal.

![Figure 10.13 Monitoring training allows the athlete to stay on track in reaching their training goal/s.](image)
10.4 Strategies to monitor and record training

Training diaries

A training diary is an athlete's personal monitoring tool which can record both objective and subjective training information. An athlete can record objective data obtained from digital tracking and also record some subjective information such as emotional feelings, energy levels and environmental factors.

![Image of training diary](image)

**FIGURE 10.14** There are many physiological, psychological and sociological parameters that can be recorded in a training diary.

There are many benefits to keeping an accurate training diary, such as to:

- gather information about an athlete's physiological, psychological and sociological influences
- increase motivation
- improve goal setting
- track progress over time
- identify any limitations to training
- provide feedback to the coach for any sessions the athlete has undertaken without their presence
- apply progressive overload correctly and prevent overtraining
- record dates for competitions.

Most importantly, a training diary helps the athlete develop a greater self-knowledge about their training and development.

Some of the specific physiological, psychological and sociological variables that can be recorded in a training diary are as follows.

**Physiological**

- Energy level *(RPE)* during training
- Heart rate responses (resting, exercise and recovery)
- Muscle soreness
- Sleep patterns (quality and quantity)
- Nutritional information
- Breathing rate
- Perspiration levels

---

*RPE* (rating of perceived exertion — Borg Scale) is a subjective rating of how hard the athlete feels they are working. It is a numerical scale ranging from 6 to 20, with 6 being no feeling of exertion and 20 being extremely hard. 13–14 is classified as moderate intensity and 15–16 is classified as vigorous.
Psychological
- Emotional and motivational variables
- Confidence levels
- Arousal levels
- Stress levels
- Goal setting

Sociological
- Temperature and weather conditions during training session
- Training time and day
- Time of training session
- Type of training session
- Place of training (indoors, outdoors, type of surface, venue)
- Training partners/team mates

Digital activity trackers
Sports science and analysis is a continually growing field and wearable technology or digital trackers are accessed by elite sports people and recreational athletes alike. Data transmission from increasingly sophisticated sensors provides both individual athletes and teams with the increased ability to reach peak fitness levels. Whether it be from a...
10.4 Strategies to monitor and record training

smart watch, wristband, smart ring, belt, chest strap or head band, there are many parameters that a digital activity tracker and wearable devices can monitor, measure and track.

Elite sports people access information from advanced technology wearable devices and Australia has been leading the field in this particular area of sports science. The Australian Institute of Sport and the Cooperative Research Centre collaborated to develop a unique, evidence-based, highly accurate and accessible approach to athlete monitoring. Catapult Sports access the Global Positioning System (GPS) and the Global Navigation Satellite System (GNSS) and use accelerometers, gyroscopes and magnetometers to provide valuable inertial movement analysis. Each system collects the athlete's micro-movements and transfers the information into algorithms providing valuable metrics for athlete analysis. Athletes and/or coaches are able to make calculated decisions based upon the following parameters that are provided using the Catapult System:

- movement patterns
- intensity
- velocity
- distance covered
- acceleration
- efforts of force from the body
- player loads.

A digital tracking system such as this is highly accurate and valuable information is wirelessly transmitted in real time to the athlete or coach for immediate analysis and adjustment to training.

The following testimonial from Melbourne Football Club's Katy Mouritz (GPS Load Analyst) outlines just an example of how Catapult digital technology impacts on elite training:

“The system has enabled us to detect discrepancies in our training loads as well as enhancing training specificity, both of which we would not have been able to do with such accuracy or detail on a quantitative level without this technology.”

Take a look at the Catapult wearable technology weblinks in your eBookPLUS to find out more about how their digital technology monitors, measures and tracks athlete information.

There are many other Global Positioning System (GPS) units that also have the ability to provide data for the analysis of various physiological parameters in real time, which is vital for monitoring athlete training. Rapid advancements in the area of sports science and research will continue to create digital activity tracking devices with increased accuracy and functionality. They will continue to develop to provide coaches and athletes with the best possible information that can be analysed to manage training volume and load, with the aim to optimise performance.
Recreational sports people use a variety of very accessible general fitness digital activity trackers to monitor, measure and track their progress in training. The popularity of these activity trackers has grown significantly in recent times. There are many brands available on the consumer market, which all offer different functions and features. Most digital activity trackers provide information on the number of steps, distance, calories burned and activity time. Some trackers also measure heart rate and allow a person to record sleep patterns and nutritional intake. The University of California, Berkeley has even developed wearable technology that analyses the chemicals in a person’s sweat as they train which sends information immediately to their smartphone. The metabolites (glucose and lactate) and electrolytes (sodium and potassium) measured in a person’s sweat can help to determine muscular fatigue and hydration status. Some companies are also tapping into the idea of ‘smart clothes’, where activity sensors are embedded into everyday clothing.

Selecting the most appropriate digital activity tracker is really dependent upon what parameters a person wishes to track. A variety of parameters have already been mentioned that are provided by different activity trackers, such as number of steps, distance covered, calories expended, activity time and heart rate measures. Some trackers also offer the ability to record locations via inbuilt GPS and these are beneficial for people who require more precise measurements about distances that they have covered. Others also provide coaching features that give actionable advice to the user.

It important to note that not all digital activity trackers are suitable for all sports, so it is important to select the tracker that is best to track the requirements of a person’s chosen sport. Make sure that you take this into account if you are considering the use of a digital activity tracker to measure, monitor and track a training program. Many activity trackers measure walking, running and cycling effectively but aren’t so effective at measuring activities such as pilates, yoga and gym sessions. The user generally has to inform the tracker if they are undertaking these types of activities. If swimming is the main choice of activity, it is important that the activity tracker is waterproof.

Generally, the more costly the device, the more impressive the features; however it is important to remember many features may not be necessary for the parameters that an individual wants to monitor. Most trackers use accelerometers to measure a person’s movements and some combine the use of accelerometers with more sophisticated movement sensors. Digital activity trackers are generally categorised as everyday activity trackers, general fitness trackers or specific training trackers.

Fitbit, Jawbone, Garmin, Polar, Misfit, Moov, Withings and Apple are some of the common brands of activity trackers available on the market and each provides a range of different trackers to cater for the needs of recreational sportspeople, high performance elite sportspeople and anyone in between. The rapid development and advancement of technology will allow more features or parameters to become more accessible to a larger variety of users. The current standard features of high-performance digital activity trackers for elite sportspeople are likely to be the standard features for recreational sportspeople in the future. The increases in sophistication in digital tracking technology will also result in a higher level of accuracy, greater ability to track more physiological, psychological and sociological parameters, and an increased automation of recording.

Figure 10.18 Digital activity trackers each have different functions and features.

Figure 10.19 Advancements in digital technology will allow for more physiological, psychological and sociological parameters to be tracked in the future.
10.4 Strategies to monitor and record training

Application software (apps)

Pairing the data from digital activity trackers with application software allows for enhanced, holistic monitoring of a person's training progress. The incremental feedback gathered from combining the two sources increases the user's awareness of not only the physiological influences but also the psychological and sociological influences on their training.

![Digital activity tracker and smartphone](image)

FIGURE 10.20 There are many digital activity tracker companion apps and stand-alone apps available to measure, monitor and track training data.

The companion apps for digital activity trackers are important as these provide the interface where the user reviews the data for analysis. They are generally able to display, record and provide a greater amount of historical information than a digital activity tracker on its own.

Just like digital activity trackers, there are many and varied apps available that provide features valued by the recreational athlete and the elite sportsperson alike. Many fitness apps are self-monitoring tracking tools that allow the user to log workouts and record physiological, psychological and sociological information similar to that of a training diary. Apps are digital training diaries and have the advantage of being easily accessible on either iPhone or android smartphones.

There are thousands of fitness apps available and it is important to choose one that meets the needs of the user. Some apps connect to a community of people who can support and motivate the user throughout their training program. Strava, Fitocracy, Endomondo and Stridekick are examples of apps that allow the user to compete and connect with others for social support. Apps such as Sworkit, FitStar, C25K (couch to 5k) and Workout Trainer provide coaching tips, personalised training and workout routines. There are apps that have inbuilt GPS, allowing the user to track distance covered, such as Map My Run and RunKeeper. There are also sport-specific training apps that provide training programs for a variety of different training methods, such as StrongLifts 5X5 and JetFit for resistance training and Pocket Yoga. Apps such as My Fitness Pal that provide calorie counting are for those who wish to monitor their nutritional intake, and apps such as Sleepbot track information about a person’s sleep habits.

There are many fitness apps that are multi-functional and allow the user to measure, monitor and track a number of different parameters, including some of the apps that have already been mentioned. The best fitness apps are the easiest to use and permit...
the user to set personal training goals, and monitor their physiological, psychological and sociological training data in order to keep them motivated and injury-free on the road to attaining their peak level of fitness and performance.

**TABLE 10.1** Some of the benefits of using digital activity trackers and/or apps combined

<table>
<thead>
<tr>
<th>Physiological factors</th>
<th>Psychological factors</th>
<th>Sociological factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step count</td>
<td>Motivation</td>
<td>Training time and day</td>
</tr>
<tr>
<td>Heart rate responses</td>
<td>Goal-setting</td>
<td>Time of training session</td>
</tr>
<tr>
<td>Sleep patterns</td>
<td>Determination</td>
<td>Type of training session</td>
</tr>
<tr>
<td>Calorie expenditure</td>
<td>Increase self-efficacy</td>
<td>Social support groups</td>
</tr>
<tr>
<td>Temperature</td>
<td>Reminder notifications</td>
<td>Break down barriers</td>
</tr>
<tr>
<td>Flights of stairs climbed</td>
<td></td>
<td>Education</td>
</tr>
<tr>
<td>Sweat analysis (new research)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEST your understanding**

1. Explain why coaches and athletes often access a variety of physiological, psychological and sociological strategies to monitor training.
2. What are four benefits of maintaining an accurate training diary?
3. Outline two physiological, two psychological and two sociological factors that can be recorded in a training diary.
4. Identify the benefits of using digital activity tracking for elite sportspeople.
5. Identify the important factors that need to be taken into account when considering the most appropriate digital activity tracker to use.
6. Outline some of the information that can be measured, monitored and tracked with the use of apps.
7. Describe two physiological, two psychological and two sociological benefits of using digital activity trackers and/or apps combined.

**APPLY your understanding**

8. A training diary is a great tool for you to use to improve your performance in any particular sport or activity. The parameters that are recorded and monitored through the use of a training diary should be specific to each individual and the particular sport and/or activity that they are training for.
   (a) Design an appropriate training diary template that would be most suitable to use during a six-week training program for an athlete of your choice. Make sure that you consider the relevant physiological, psychological and sociological factors that are important to include.
   (b) Explain how the information that will be recorded in the training diary will inform the participant of any necessary modifications that may need to be made to their training program.
9. Compare and contrast at least four different digital activity trackers and recommend the most appropriate one to use during a six-week training program for an athlete of your choice. You must provide a justification as to the reasons for your selection.
10. Select an app that would be suitable to use during a six-week training program for an athlete of your choice. Make sure to monitor and record data.
11. **Practical activity: interview**
    Interview someone who is currently undertaking a training program. This may be an elite sportsperson or someone who is just aiming to improve their fitness.
    (a) Find out how they are measuring, monitoring and recording their training data and examine if and how any of the data they have gathered have helped inform their training program design.
    (b) After you have gathered the information from the interview, critique the effectiveness of their monitoring and provide any necessary recommendations for improvements.
    (c) Analyze whether you would provide any training program modifications based on the training data that has been monitored and recorded. Provide a justification for your decision.
KEY SKILLS

MONITORING AND PLANNING
A TRAINING PROGRAM

EXPLAIN THE IMPORTANCE OF MAINTAINING PHYSIOLOGICAL, PSYCHOLOGICAL AND SOCIOCULTURAL DATA RECORDS
EXPLAIN THE PURPOSE OF A COOL-DOWN AND DISCUSS THE IMPACT OF NOT COMPLETING ONE

PRACTICE QUESTION

1. A Year 11 Physical Education class at ACHPER Secondary College intends to complete the Great Victorian Bike Ride event. They have entered the five-day event, which covers a total of 318 km. During term 4, they intend to complete the following training program for the nine weeks leading up to the event. Training includes a mixture of lunchtime, after-school and weekend cycling training.

<table>
<thead>
<tr>
<th>Week</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Saturday</th>
<th>Sunday</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20 km cycle</td>
<td>Spin class 30 mins</td>
<td>40 km cycle</td>
<td>30 km cycle</td>
<td>90 km cycle</td>
</tr>
<tr>
<td>2</td>
<td>20 km cycle</td>
<td>Spin class 30 mins</td>
<td>45 km cycle</td>
<td>30 km cycle</td>
<td>95 km cycle</td>
</tr>
<tr>
<td>3</td>
<td>25 km cycle</td>
<td>Spin class 30 mins</td>
<td>45 km cycle</td>
<td>30 km cycle</td>
<td>100 km cycle</td>
</tr>
<tr>
<td>4</td>
<td>25 km cycle</td>
<td>Spin class 35 mins</td>
<td>50 km cycle</td>
<td>30 km cycle</td>
<td>105 km cycle</td>
</tr>
<tr>
<td>5</td>
<td>25 km cycle</td>
<td>Spin class 35 mins</td>
<td>55 km cycle</td>
<td>30 km cycle</td>
<td>110 km cycle</td>
</tr>
<tr>
<td>6</td>
<td>25 km cycle</td>
<td>Spin class 35 mins</td>
<td>60 km cycle</td>
<td>30 km cycle</td>
<td>115 km cycle</td>
</tr>
<tr>
<td>7</td>
<td>25 km cycle</td>
<td>Spin class 40 mins</td>
<td>70 km cycle</td>
<td>30 km cycle</td>
<td>125 km cycle</td>
</tr>
<tr>
<td>8</td>
<td>25 km cycle</td>
<td>Spin class 40 mins</td>
<td>75 km cycle</td>
<td>30 km cycle</td>
<td>130 km cycle</td>
</tr>
<tr>
<td>9</td>
<td>20 km cycle</td>
<td>20m SRT Test</td>
<td>30 km cycle</td>
<td>Rest</td>
<td>50 km cycle</td>
</tr>
<tr>
<td>10</td>
<td>Participate in Great Victorian Bike Ride</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. **Explain** the importance of maintaining physiological, psychological and sociocultural data records in the lead up to the Great Victorian Bike Ride event. (5 marks)

b. Some of the Year 11 students were hesitant to perform a cool down after every training session. **Explain** the purpose of a cool down and **discuss** the impact of not completing one. (5 marks)

SAMPLE RESPONSE

a. Physiological training data provide information about the body’s physical functioning in relation to training. Psychological training data provide the athlete with an understanding of their mental readiness and include thoughts, feelings and cognitive characteristics that may
affect training. **Sociological training** data provide context about the broader social, cultural and environmental factors that contribute to an athlete’s training performance. Monitoring training provides an understanding as to how hard an athlete is working, paralleled with how well they cope physiologically, psychologically and sociologically with the training load. It is important that monitoring is used to inform and evaluate a training program so that it remains effective in achieving the desired goals.

b. **A cool down involves the Year 11 students completing a low-intensity activity at the end of the conditioning component of the training session. The cool down allows the heart rate and blood flow to the muscles to remain elevated, which assists in preventing venous pooling, removing metabolic by-products and gradually returning the body back to its resting physiological state.** If the Year 11 students choose to cease their high-intensity conditioning component without completing a cool-down, **their muscles will no longer continue to contract and help to propel blood back to the heart (skeletal muscle pump effect).** As a result, blood may pool in their veins, especially in the lower limbs. This venous pooling can result in a decreased venous return to the heart. Consequently, less blood is re-oxygenated via the lungs, and less metabolic by-products (carbon dioxide and lactic acid) are removed from the muscle tissues.

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**HOW THE MARKS ARE AWARDED**

- **3 marks:** (1 mark each) for describing the meanings of physiological, psychological and sociological that can be recorded
- **2 marks:** for linking how monitoring the factors can inform the athlete or coach about the effectiveness of a training program
- **1 mark:** for outlining what a cool down consists of
- **2 marks:** for describing the purpose of a cool-down
- **2 marks:** for discussing the impact of not completing a cool down
CHAPTER REVIEW MONITORING AND PLANNING A TRAINING PROGRAM

CHAPTER SUMMARY

The design and periodisation of a training program
- The design and implementation of a training program requires a step-by-step approach that incorporates information obtained from an activity analysis and fitness assessment, the appropriate application of training principles and the selection of relevant training methods.
- It is necessary to plan the length of the training program, ensuring that the proper periodisation of training is incorporated in the program. The number of specific training sessions and the content of each of these sessions then need to be determined and recorded via a training timetable.
- The term periodisation of training basically refers to the dividing of a training program into smaller phases of training. Typically, these phases of training are known as:
  - the preparatory phase
  - the competition phase
  - the transition phase.
- The preparatory (pre-season) phase of training aims to develop a suitable fitness and skill base for the competition phase. The main objective of the competition (in-season) phase is to maintain fitness and skill attributes, as well as develop and refine strategies, tactics and game plans. The transition (off-season) phase is designed to provide the athlete with a physiological and psychological break from the demands of training and competition.
- Block or nonlinear periodisation incorporates blocks of highly specific and concentrated periods of work with more frequent variations in load. It is specialised and concentrated in its approach to each work block.
- Peaking and tapering are important considerations in the design of training programs. Peaking refers to the planning of training so that an athlete obtains their optimum state of readiness to perform at a particular predetermined time, such as a major event or competition. Tapering refers to a reduction in training loads, particularly the volume of training prior to a major event, to allow for complete recovery. The goal of peaking and tapering is to produce a fresh, rested, uninjured athlete who is ready to perform at their optimum level at a given time.
- The main goal of a training program is to prepare an athlete to be able to perform at their best. The concept of tapering is not appropriate for all sports, particularly sports which have weekly competitions; however these athletes still require periods of recovery in order to perform at their peak.

Components of an exercise training session
- Each individual training session should consist of a warm-up, a conditioning phase and a cool down.
- The warm-up is designed to prepare the body both physiologically and psychologically for the conditioning phase of the training session. A gradual increase in the intensity level of physical activity is performed in order to increase the heart rate, blood flow and ultimately the temperature of the muscles to be used. A warm-up provides the opportunity for the body to transition from a resting state to the higher physiological demands of the conditioning phase of training.
- The conditioning component is the main focus of the training session and it may include a skill development phase and/or a fitness conditioning phase.
- The cool down transitions the body gradually from high intensity exercise back to resting levels. It involves completing low-intensity exercise, allowing for the maintenance of blood flow and the prevention of venous pooling.
- At the end of the cool down component, stretching should take place in order to improve the flexibility of the muscles and reduce any stiffness or soreness. An athlete gains the most benefit from stretching when the muscles are still warm and the ligaments and joints are more elastic.

Strategies to monitor and record training
- There are many strategies available to athletes and coaches in order to monitor and record their physiological, psychological and sociological training data so as to reach a peak level of performance. The ultimate goal of a training program is to achieve the necessary chronic responses to improve an athlete’s performance in a particular sport.
or activity and monitoring training is essential to keep the athlete on track to reaching this goal.

- It is important that monitoring is used to inform and evaluate training and not simply as a method of collecting data. The information provided can allow the athlete to incorporate the concepts of peaking and tapering effectively into their training program.
- A training diary is an athlete’s personal monitoring tool that can record both objective and subjective training information and there are many physiological, psychological and sociological benefits to keeping a training diary.
- Sports science and analysis is a continually growing field and wearable technology or digital trackers are accessed by elite sportspeople and recreational athletes alike. There are many parameters that digital activity trackers can monitor.
- There are many and varied apps available that provide various features valued by both recreational athletes and elite sportspeople. The best fitness apps are the easiest to use and permit the user to set personal training goals, and monitor their physiological, psychological and sociological training data in order to keep them motivated and injury-free on the road to attaining their peak level of fitness and performance.

EXAM PREPARATION

MULTIPLE CHOICE QUESTIONS

1. (ACHPER Trial Exam 2013, question 10) The following graph represents the training load of an under-18 netball team from six weeks, down to three weeks prior to the finals. Which training principle is demonstrated in the graph?

![Graph showing training load from 6 weeks to 3 weeks prior to finals]

**FIGURE 10.21** Training load prior to finals

- (A) Specificity
- (B) Tapering
- (C) Overload
- (D) Peaking

2. (ACHPER Trial Exam 2006, question 19) As part of her training for the 400 m event, an elite athlete completes 4 × 250 m sprints in 30 seconds, with 60 seconds rest between each sprint. At the completion of her training session, the athlete should perform an active recovery in order to

- (A) prevent venous pooling.
- (B) assist in the breakdown and removal of accelerated metabolic by-products such as lactate and hydrogen ions.
- (C) keep the heart rate elevated to assist oxygen delivery to skeletal muscles.
- (D) All of the above.

3. An example of sociological training data that may be monitored is

- (A) heart rate response.
- (B) level of motivation.
- (C) training environment.
- (D) rate of perceived exertion (RPE).
4 One of the main purposes of a warm-up is to
(A) practise skills, game plans, tactics and strategies.
(B) increase blood flow to the muscles, which results in an increase in muscle temperature.
(C) prevent venous pooling.
(D) develop and maintain specific fitness components.

5 The three main phases involved in the traditional periodisation of a training program are:
(A) the introductory phase, the competition phase and the transition phase.
(B) the preliminary phase, the competition phase and the conversion phase.
(C) the preparatory phase, the competition phase and the transition phase.
(D) the preparatory phase, the execution phase and the transition phase.

6 An example of psychological training data that may be monitored is
(A) breathing rate.
(B) level of arousal.
(C) training environment.
(D) rate of perceived exertion (RPE).

7 The general phase of a warm-up involves undertaking
(A) sport-specific skills training.
(B) activities that involve agility, speed and acceleration.
(C) dynamic stretching.
(D) low to moderate intensity cardiovascular continuous exercise.

8 The monitoring and recording of training is essential for
(A) assessing an athlete's strengths and weaknesses.
(B) informing and evaluating training progress.
(C) collecting data.
(D) using up-to-date sports science technology.

9 A training session should comprise of the following sequence:
(A) conditioning component, warm-up, cool-down, dynamic stretching.
(B) warm-up, static stretching, conditioning component, cool-down.
(C) warm-up, dynamic stretching, conditioning component, cool-down.
(D) conditioning component, cool-down, warm-up, dynamic stretching.

10 The term 'peaking' refers to when an athlete
(A) is overtraining.
(B) reaches their optimum state of readiness.
(C) reduces their training load.
(D) reduces their aerobic conditioning.

TRIAL EXAM QUESTIONS

Question 1 (adapted from ACHPER Trial Exam 2015, question 10)
Michael Clarke is an Australian cricketer who hit a score of 128 off 163 balls in two days of play during a five-day test match against India. In the same summer season, Peter Handscomb hit a score of 103 off 64 balls in a Twenty20 game that was completed in three hours.

a. Discuss the importance of Michael Clarke and Peter Handscomb monitoring and recording their training data in the lead-up to their cricket games. Outline the types of data that may be monitored. 4 marks

b. Recommend one appropriate training monitoring tool that both Michael Clarke and Peter Handscomb could adopt. 2 marks

c. Justify why it would be important for both Michael Clarke and Peter Handscomb to include skill development as a part of their training session conditioning component. 2 marks
Question 2
(adapted from ACHPER Trial Exam 2012, question 11)

In the lead-up to her school’s cross-country run, Gertrude completes the following training program.

<table>
<thead>
<tr>
<th>Event Week</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>20 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
<tr>
<td>Week 2</td>
<td>22 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
<tr>
<td>Week 3</td>
<td>22 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
<tr>
<td>Week 4</td>
<td>24 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
<tr>
<td>Week 5</td>
<td>24 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
<tr>
<td>Week 6</td>
<td>20 min continuous running</td>
<td>20 min Fartlek</td>
<td>20 min continuous running</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event Week</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>20 min continuous running</td>
<td>Cross-country race</td>
<td>20 min pool session</td>
</tr>
<tr>
<td>Week 8</td>
<td>Pilates</td>
<td>30 min continuous cycling</td>
<td>20 min pool session</td>
</tr>
<tr>
<td>Week 9</td>
<td>Pilates</td>
<td>30 min continuous cycling</td>
<td>20 min pool session</td>
</tr>
</tbody>
</table>

a. Prior to starting the above training program Gertrude should have completed two important steps. What were they? 2 marks

b. Psychological data monitoring identified that Gertrude was losing motivation and wasn’t enjoying undertaking the training program anymore. Provide a recommendation to Gertrude as to how you would modify her program to overcome this factor. 2 marks

c. For Gertrude’s 9-week training block, identify which week/s you would consider Gertrude to be undertaking the preparatory and transition phases of periodisation?
  
  Preparatory phase — Week/s ____________
  Transition phase — Week/s ____________ 2 marks

d. Explain why Gertrude completes a transition phase as a part of her 9-week training block. 2 marks

e. Gertrude was hesitant to perform a warm-up before every training session. Explain why you would recommend that Gertrude does complete a warm-up prior to every session. 2 marks