

CHAPTER 2: Injury prevention and the rehabilitation of injury

Practice questions - text book pages 53 - 54

- 1) Sports injuries can be broadly classified as either acute or chronic.
a) Explain what is meant by these two classifications, using examples where appropriate. 4 marks

Answer:

- **Acute** injuries refer to sports injuries that happen in a moment.
- For example, a hamstring pull during a sprint race.
- **Chronic** injuries develop over time and so are characterised by a slow, sustained development of symptoms.
- That culminates in painful inflammatory conditions.
- For example, patellar tendinosis or jumper's knee, which is caused by inflammation of the bottom of the patella.

- b) What are the common causes of chronic injuries? 3 marks

Answer:

3 marks for 3 of:

- Overuse.
- Overtraining.
- Poor technique.
- Inappropriate kit/footwear.

- 2) a) Describe the medical condition known as tendinopathy. 2 marks

Answer:

2 marks for 2 of:

- Tendinopathy refers to a disease of a **tendon**, such as tendonitis, on palpation and pain.
- Including tenderness and **inflammation**, resulting from excessive **overuse**.

- b) What are the similarities and differences between golfer's elbow and tennis elbow? 6 marks

Answer:

3 marks for 3 for similarities:

- Both conditions result from excessive **overuse** of the **forearm** during sporting activities.
- That allow an individual to **grip**, **rotate** and **flex** the wrist.
- Pain and swelling are created as a result of pulls or tiny tears in the tendons.
- A tender local hot spot over the epicondyle.
- Thickening of the tendon.
- Weakness in the wrist.
- Both are the result of **repetitive faulty technique**.

3 marks for 3 for differences:

- **Tennis elbow** mainly affects the **outside** aspect of the elbow, when the **lateral** epicondyle is subjected to pressure.
- And is associated with racket sports such as tennis, squash and badminton.
- **Golfer's elbow** mainly affects the **inside** aspect of the elbow, when the **medial** epicondyle is subjected to pressure.
- And is associated with activities such as playing golf, throwing the javelin, or bowling at cricket.
- It is caused by **overusing** the muscles in the forearm that allow the individual to grip, rotate the arm, and flex the wrist.

- 3) Why are joint sprains a particular problem? 2 marks

Answer:

2 marks for 2 of:

- Most common sprains are in the ankle and wrist joints where several ligaments are involved depending on the severity of the sprain.
- There is an immediate **loss of functional range** of motion.
- Prolonged **immobilization** delays the healing of a sprain.
- And this usually leads to **muscle atrophy** and a **stiff joint**, particularly in weight bearing ankle joints.

- 4) Screening is a key part of the professional sportspersons daily life.
How can it be used in injury prevention? 4 marks

Answer:

4 marks for 4 of:

- **Screening** is a search for a specific condition that can help to detect health risk factors, for example, undetected cardiac abnormality.
- Standard screening tests are used to assess **strengths** and **weaknesses** in key areas, such as strength, flexibility, core control and balance.
- This information can be used for exercise prescription for musculoskeletal **conditioning** thereby decreasing the risk of getting injured.
- **Regular screening** provides information about physical changes over time, which is particularly important in the growing athlete and for an athlete following long hours of training/competition

- 5) Rapid recovery from injury is vital for elite performers and they now use a wide range of injury recovery techniques.
For each of the following methods describe the treatment and its purpose.

- a) Cryotherapy. 3 marks

Answer:

- Cryotherapy is the general or local use of **cold temperatures** in the treatment of injury.
- **Ice baths** and **cryogenic chambers** are often used as part of post-match recovery.
- **Stops internal bleeding** to reduce swelling and aid recovery.

- b) Proprioceptive retraining. 3 marks

Answer:

- **Proprioception** is the body's awareness of position, movement and changes in state of balance.
- Supplied by proprioceptors in joints, tendons and muscles as well as visual and auditory senses.
- Proprioceptive retraining is a viable behavioral therapy for improving **impaired motor function** sustained in an injury.
- Achieved by using a series of activities, such as balance board exercises, aimed at **rebuilding** the performer's proprioceptive sense.
- Its main function is to induce **cortical reorganization** for improving sensori-motor function.

- c) Therapeutic massage. 3 marks

Answer:

- Therapeutic massage is the application of **massage techniques** to the muscle and connective tissues to enhance sports performance.
- Used to increase range of movement/**flexibility** and to relieve **muscle soreness**.
- May help injury prevention and promote **faster recovery**.

- 6) Playing kit and equipment are major factors that an athlete needs to consider in injury prevention.
Identify the key factors that affect the selection of their use. 4 marks

Answer:

- Equipment needs to be appropriate to the **playing surface**. For example, selection of appropriate hockey sticks to playing surfaces.
- **Shoes** or boots are the most important item of clothing. They should be selected to meet the demands made on the foot. For example, running shoes provide both support and shock absorption for hard running surfaces, squash shoes provide closer contact with the court therefore have less support.
- But they grip the surface better (greatest possible friction between shoe and surface).
- Ski boots are extremely robust, supporting high above the ankle joints.
- Equipment needs to be checked for possible **defects** prior to use. For example, safety check for fibreglass poles.
- Choosing **protective clothing** is important for potentially dangerous sports such as cricket, boxing and fencing.
- Kit needs to **fit** well.

- 7) Tiny tears and inflammation can develop near the site of an injury.
a) Explain how cooling down and compression clothing can speed up the recovery process. 6 marks

Answer:

- *Cool-down*, by continuing of *low intensity exercise* at the end of an intense session.
- Will keep *capillaries open* longer, allowing *oxygenated* blood to reach exhausted muscle
- Where the oxygen is available for *aerobic respiration* and ATP is created.
- Which will remove *lactic acid* from the muscle and hence associated pain (DOMS).
- *Compression clothing* works by applying a constant pressure on the body part, which adds external pressure to the veins.
- By squeezing the muscle, *venous return* is enhanced, which may reduce the potential for venous pooling.

- b) Explain why it is important for an athlete to recover after exercise. 4 marks

Answer:

- After exercise, it takes *time* for the muscles used to return to their base level of *ATP* content.
- And *glycogen* stores.
- And any *other molecules* used during the exercise (vitamins and minerals for example).
- Hence the importance to allow time for *replenishment* to occur.

- c) Identify three other strategies used by athletes to speed up recovery. 3 marks

- *Cryotherapy*, ice baths, cold chambers.
- *Massage*.
- *Sauna*.
- *Rest*, or active rest.
- *HBOT*, hyperbaric oxygen therapy.
- *Hydrotherapy*, aquajogging in warm water.

- 8) Hyperbaric oxygen chambers and ice baths are aids to rehabilitation for elite performers.
Briefly describe how each of these therapies assist in this process. 6 marks

Answer:

- A *hyperbaric oxygen chamber* is pressurised with increased amounts of oxygen.
- Aims to reduce the injury recovery time.
- By *stimulating* the growth of new blood vessels.
- By *increasing* the oxygen concentration to damaged tissues such as in pulled muscles or stress fractures.
- Aids the *treatment of infection* by boosting white blood cell activity around the damaged tissues, thereby controlling infection.
- *Ice baths* use the fact that local tissue inflammation can be reduced by *chilling* the affected area.
- The athlete remains in the ice bath for 5-10 minutes.
- During this time the cold water causes the blood vessels to *vasoconstrict*.
- Thereby draining blood and any lactic acid away from the immersed body parts.
- On leaving the ice bath, the immersed body parts fill up with freshly oxygenated blood as blood vessels *vasodilate*, thus aiding recovery.

9) Describe a suitable method of treatment that is appropriate for an acute soft-tissue injury.

4 marks

Answer:

4 marks for four of:

- Immediately following an acute injury, the injured person should **cease activity**.
- The injured area must be **immobilised** to prevent further injury.
- The most important physical therapy used at this stage is **cryotherapy** (cold therapy).
- Accompanied by **protection** (strapping or bandaging).
- **Optimal loading** (very light exercise which stimulates blood flow to the affected area).
- **Rest, ice, compression and elevation**.
- This combination is known as **POLICE**.

10) Explain how periodisation could be used to minimise the risk of sports injuries.

4 marks

Answer:

4 marks for four of:

- Periodisation of training is a method which **varies** training loads and intensity.
- By organising training in phases or periods with each phase:
 - With **increasing** heavy loads followed by **rest** or very low intensity.
- Then followed by a **further increase** in training loads (and so on) in the next phase.
- Usually, the **aims** of each phase of training will be **different** (for example, increase in strength, or improved flexibility and so on).
- This means that the risk of injury is reduced because the shear volume of training (which can cause injury by overtraining) is not at a continuous high level.

- 11) Elite competitors often continue training with and through their injuries. Discuss the implications for coaches and sports medical teams in establishing an appropriate protocol for rehabilitation and return to sport from injury. 15 marks

Answer:

- A **rehabilitation** is the process of restoring full physical function after injury.
- A rehabilitation and **strengthening** programme is essential for full recovery and to prevent further injuries.
- The major aim for the coach/medical teams is to provide this programme and work together until **normal fitness** and performance levels have been re-gained by the injured athlete.
- The major problem for the injured athlete, following an injury, is the **reversibility** of training effects needed for that particular sport.
- This is because when **training loads** are reduced or **completely removed**, the state of fitness or performance returns to a normal **untrained** state.
- For the coach, this would involve adjusting the training programme within the **periodised year**.
- This would involve reducing the frequency, intensity and duration, a switch of the **overload** principle to **moderation**, in order to accommodate injury rehabilitation.
- The specific programme parameters of strength, flexibility, power, endurance, and **hypertrophy** must also be carefully considered and targeted when planning the programme.
- Strength training typically involves a load/intensity of 80-100% of 1RM.
 - For example, a weight lifter is recovering from a biceps injury.
 - The coach would reduce the load intensity for shoulder/upper arm exercises with more repetitions, then gradually build up the load and reduce the repetitions as the injury heals.
- For example, a middle distance athlete, recovering from a stress fracture of the femur, would train in good supporting flat trainers on a soft running surface, such as grass, and gradually build up intensity and duration of runs on this surface until able to transfer to wearing spikes and training on a synthetic track.
- The coach would also be aware of the need for **varying** the activity by using **cross training** activities.
 - For example, in the early stages of recovery from a stress fracture of the femur the same athlete may be directed by the coach to use a cycle ergometer in order to maintain cardiovascular fitness and ROM and at the same time reduce loading on the legs.
- Another coaching strategy that is widely used for fracture recovery is **aquajogging**.
- Here the injured athlete is able to maintain running action with aspects of power, speed, endurance, ROM build into the training programme, without any undue stress on the lower limbs.
- In many of the National **hubs**, such as UK Athletics based at Loughborough University, the coach and athlete will have access to a conditioning coach who works with both the coach and medical support teams to provide **rehabilitation support**.
- **Sports medical teams** based at national hubs, are involved from the acute injury stage to full recovery.
- And provides a variety of therapies and specialist medical support personal.
- The physiotherapist provides a key role by offering variety of therapies to meet the needs of the injury.
- Once the acute phase is over, the physiotherapist may use heat and cold therapies, ultrasound, electrical stimulation along with gentle static and passive stretching.
- Massage techniques assist in soft tissue mobilisation, muscle function and reduce local pain.
- After two weeks, ROM and strength can be increased using PNF stretches.
- The introduction of functional performance testing, also known as **screening**, provides **feedback** on observation and examination of the injury.
- For example, the sit and reach test is a test that physiotherapists and conditioning coaches use to assess hamstring flexibility.
- Following a hamstring injury the regular use of this test would provide information on the healing process of the injured hamstring.
- If the athlete is recovering from surgery, the surgeon will arrange to see the injured athlete throughout the healing process and will use technologies such as X-rays and diagnostic scanning machines to assess the healing process.
- A **nutritionist** can also advice the athlete on a diet planned for injury recovery that should include **anti-inflammatory** agents such as leafy green vegetables and spices such as turmeric.
- Supplementing the diet with whey protein will assist in the rebuilding of tissue repair and growth.
- During the recovery period, an athlete may lose **self-confidence** and be very upset.
- A sports psychologist can provide interventions on recovery centred on personal variables that are mainly linked to **motivation**.
- The support an athlete needs to continue training with an injury is complex. Most elite athletes are fortunate as they have access to a supporting team that, through regular communication/meetings, that can respond immediately to an injury and provide a progressive and monitored recovery programme when needed.

- 12) Discuss the advantages and disadvantages of contemporary rehabilitation strategies when dealing with sports injuries.

8 marks

Answer:

Note: Suggest you select two from the following strategies:

4 marks for four of: Table 2.3 - advantages and disadvantages of compression clothing

advantages	disadvantages
compression clothing increases venous return and transportation of oxygenated blood to body tissues	compression clothing is expensive to buy
removes waste products such as lactic acid	if clothing is too tight, it can cause tissue damage and decrease ROM
recovery is improved and DOMS and cramping are reduced	need to seek specialist guidance on fabric specifications
compression stockings help prevent DVT following surgery	the rationale for wearing compression sportswear is solid, but the evidence is weak
reduces muscle oscillation	
muscle and joints can be passively moved to full range	
increases proprioception	
body shape is more aerodynamic	

4 marks for four of: Table 2.5 - advantages and disadvantages of physiotherapy

advantages	disadvantages
physiotherapy offers a range of recovery methods that treat both acute and chronic musculoskeletal field injuries within a rehabilitation programme	physiotherapists rely on the experience of other team members that may not always be correct in their injury diagnosis
this ranges from joint, nerve and soft tissue mobilisations as well as other modalities which are underpinned by a scientific evidence base, such as ultrasound and electro stimulation (ES)	going privately for both physiotherapy and sports massage sessions is expensive
ultrasound reduces the healing time of certain soft tissue injuries, during the early rehab phase, by acting as a pro-inflammatory agent	ultrasound therapy has been associated with nervous damage and should only be applied during the early stages of rehab
ES serves is to stimulate weaker muscles to contract and improve strength more quickly	in acute injuries, taping may restrict circulation
sports massage assists in soft tissue mobilisation, muscle function and pain reduction during the repair stage	massage cannot be used on soft tissue injuries such as tendon ruptures and open wounds
muscle and joints can be passively moved to full range	
sports massage can be used as a gentle recovery method during the acute stage of an injury to assist in lymphatic drainage in order to reduce swelling	tape may cause may cause irritation by mechanical or chemical means or because of allergy and the effects may be exaggerated by sweating, itching and bacterial infection
taping and bracing are recovery methods used by physiotherapists to support a weakened part of the body, without limiting its function	taping may lull the athlete into a false sense of security, encouraging the athlete to resume his or her sporting activity too soon thereby making the injury worse
physiotherapists are part of a team which includes doctors, other therapists, sport psychologists and coaches who work together to maximise the athlete's recovery	

12) continued

4 marks for four of: Table 2.6 - **advantages and disadvantages of climate chambers**

advantages	disadvantages
environmental chambers replicate different climates at the press of a button with precise and harmonious control of altitude, temperature and humidity	access to climate chambers may be difficult and therefore climate chamber treatment may be limited
to provide controlled environments where rehab of both acute and chronic injuries can take place from the initial injury phase to active full recovery	methods may be restricted to those who can afford it or elite athletes who are supported by a medical care scheme
HBOT facilitates a speedier resumption to pre-injury activity levels, following injury, due to increased delivery of increased amounts of oxygen to body tissues	not always 100% effective
hypobaric chambers stimulate erythropoietin production and hence oxygen uptake that can be used to stimulate the healing of bone fractures	

4 marks for four of: Table 2.7 - **advantages and disadvantages of cryotherapy**

advantages	disadvantages
less pain because nerve activity is slowed down	if an ice pack is too cold or applied for too long, it can actually damage skin and nerve tissues
less swelling because constriction of the blood vessels helps reduce blood flow to the area, reducing swelling	prolonged exposure in a cryochamber can give the athlete hypothermia, in addition to long-term tissue damage.
faster healing because cellular activity slows down, which contributes to a faster healing process	the sudden drop in body temperature can be harmful, causing a sudden increase in heart rate and breathing rate.
removes waste materials from the injured site	

4 marks for four of: Table 2.8 - **advantages and disadvantages of heat therapies**

advantages	disadvantages
a combination of hot and cold therapies dilates and constricts the blood vessels of the muscles thereby increasing the flow of oxygen and nutrients to musculoskeletal tissues, helping to heal the damaged tissue and removing waste products	heat treatment should not be too hot, as this may lead to the skin being burnt
heat stimulates voluntary muscles and the sensory receptors in the skin, decreasing the transmissions of pain signals to the brain and partially relieve the discomfort	heat treatments should not be used on damaged skin or on areas where circulation is poor
heat application facilitates stretching the soft tissues, including muscles, connective tissue, and adhesions that become stiff following injury	
hydrotherapy provides a safe, low impact form of heat therapy used in rehabilitation programmes	

4 marks for four of: Table 2.9 - **advantages and disadvantages of RICE and POLICE**

advantages	disadvantages
RICE is an established first aid procedure using during the initial injury phase	people can take the rest phase a little too far, and that can lead to decreased muscle strength and flexibility and so delay the restoration of normal functional mobility and activity
POLICE extends the remit of RICE to include protection and optimal loading and so deals with both the initial phase of an injury to the recovery phases of healing and rehabilitation	compressing an injury may reduce swelling, but when too tight it can cause numbness, tingling, or increased pain some experts believe that ice, applied initially after an injury, impedes the normal healing process

- 13) A basketball player twists his ankle in a game and has to leave the court. 4 marks
 a) Describe the immediate treatment that he should use.

Answer:

- **RICE**
- **Rest** – stop the activity as soon as the injury occurs to prevent making it any worse.
- **Ice** – applied to injured area for 10-15 mins then taken away for 20 mins (and repeat). Reduces internal bleeding and swelling.
- **Compression** – Reduces swelling and so speeds recovery.
- **Elevation** – elevate injured area above heart. Reduces swelling and inflammation.

Or

- **POLICE**
- **Protection** – rest and protect injured area.
- **Optimal loading** - working out what you can do, without injuring yourself any more.
- **Ice** – applied to injured area for 10-15 mins then taken away for 20 mins (and repeat). Reduces internal bleeding and swelling.
- **Compression** – Reduces swelling and so speeds recovery.
- **Elevation** – elevate injured area above heart. Reduces swelling and inflammation.

- b) The injury does not respond to the treatment. Identify two other treatments that could be used to help recovery. 3 marks

Answer:

- **Cryotherapy** – the use of cold temperatures (e.g. cryogenic chambers)
- **Hyperbaric chambers** / oxygen tents
- **Hypoxic tents** (simulating high altitude to promote red blood cell production).

- 14) Discuss the principles and guidelines for injury prevention. 5 marks

Answer:

- Well-planned fitness programmes to include **FITT** principles of training.
- **Frequency** or the number of sessions.
- **Intensity** of the session.
- **Type** of training.
- **Time** taken to train.
- **Overload** and **progression** result from training activities getting harder.
- In order to stress physiological adaptations required.
- **Moderation** implies that note is taken of the sportperson's state of physical health.
- And when signs of deteriorating performance are detected training loads must be reduced.
- And **recovery** time increased.
- Rest or recovery between sets and training sessions must be adequate.
- **Warm-up** prepares the musculo-skeletal systems for exercise by raising muscle temperature, oxygenating active muscle tissue, stretching muscle tissue, mobilising joints and meeting the demands of sport-specific drills.
- **Cool-down** is a way of reducing **DOMS** by flushing out lactic acid and increasing flexibility of joints.
- **Diet** is aimed at refuelling depleted energy reserves.

- 15) Why should stretching be part of an injury preventative training programme? 2 marks

Answer:

- The **stretch reflex** limits flexibility.
- Stretching over an extended period of time **inhibits** the activation of the stretch reflex.
- Causing an increase in the resting length of soft tissues such as ligaments, tendons and muscles.

16) Discuss the importance of nutrition as part of an injury rehabilitation programme.

6 marks

Answer:

- The **right food** and supplements can speed injury and recovery from exercise.
- **Glycogen depletion** and dehydration occur following a hard training session.
- A **hypertonic sports drink**, immediately after exercise, will help to restore fluid and electrolyte losses, in addition to starting the process of glycogen repletion.
- A **high CHO** meal, eaten as soon as possible, continues glycogen replenishment.
- For optimal recovery **protein** mixed with CHO will aid protein resynthesis.
- Protein supplements, such as whey protein, will support muscle hypertrophy.
- During a **hard training** session **micro muscle tears** occur and can cause local inflammation.
- Some foods contain anti-inflammatory agents as found in avocados, fish (mackerel and salmon), mixed nuts, seeds and garlic.
- **Avoid pro-inflammatory foods**, such as processed foods high in saturated fats, and foods containing trans fats found in cakes, pies and cookies.
- Eat foods that are rich in **vitamins** and **minerals**.
- For example, vitamin D is found in fatty fish, eggs and dairy produce, aids the absorption of calcium and phosphorus needed for skeletal recovery and repair.
- Iron, found in dark green vegetables such as spinach. Is a constituent of haemoglobin.
- Helps the transfer of oxygen in red blood cells.

17) Assess the use of POLICE rather than RICE as a rehabilitation strategy for sporting injuries sustained in a team game.

8 marks

Answer:

Four marks for:

- **POLICE** extends the remit of RICE to include **protection**.
- And **optimal** loading.
- So deals with both the **initial phase** of an injury.
- To the **recovery phases** of healing and rehabilitation

4 marks for four of:

- The first goal after an injury is to do **no further harm** and therefore, it is important to consider **protection**.
- **Ice, compression** and **elevation** are useful to help with swelling management and are important especially in the first few days.
- So why replace rest with optimal loading?
- While rest may be helpful in the very short term, continued rest may lead to **deconditioning** of the tissues – joint stiffness, muscle weakness and tightness and reduced proprioception (control and balance).
- **Optimal loading** will stimulate the healing process as bone, tendon, ligament and muscle all require some loading to stimulate healing.
- The right amount of activity can help manage swelling.