Chapter 2

Introduction to sports injury and assessment

Introduction

Regular participation in sport and exercise has positive physical, mental and social health enhancing properties. These include improved quality of life and vigour, reduced risk of chronic disease such as cardiovascular disease (CVD), diabetes, obesity, and depression, improved longevity and the maintenance of independence into older age.

However, regular participation in sport and exercise can sometimes have a detrimental effect on health in the form of injury. The effects that such injuries have on an individual's health can be relatively minor, with only a short period of rest needed, or more profound resulting in athletes having to retire from their careers. Sport- and exercise-related injuries do not just affect elite performers, but are a significant problem at every level of participation. Around a third of all emergency consultations are directly linked to sport and exercise. Although participation in any form of activity carries a risk of injury the overall health benefit of activity far outweighs this risk.

Learning outcomes

After you have read this chapter you should be able to:

- define sports injury
- classify sports injuries
- understand common causes of sports injuries
- understand how to prevent sports injuries
- identify common sport-related injuries
- understand how the body reacts to being injured
- explain key principles of sports injury assessment.

Starting block

You have been appointed as the sports therapist for a professional rugby league club. The head coach you will be working with mentions that over the last few seasons the club has been suffering with high occurrence of injury. He would like you to reduce the number of injuries his players get. Consider the following:

- How you would approach this task?
- What information will you need to gather?

Definitions of sports injury

Sport injuries are diverse in terms of the mechanism of injury, how they present in individuals, and how the injury should be managed. Defining exactly what a sports injury is can be problematic and definitions are not consistent. In this chapter a sports injury is defined as any damage to tissues as a direct result of participating in sport and exercise, which causes the frequency and/or intensity of participation to be changed or ceased. This definition includes minor sports injuries that may not receive medical treatment in addition to more severe injuries that do require medical attention.

All sports injuries can be sustained in a normal active lifestyle. For example, a grade II sprain of the ankle can be sustained as a result of a poor tackle in soccer, or by stumbling on a poorly maintained footpath while out walking.

Occurrence of sports injuries

Sports injuries are common. However, it is difficult to answer the following questions:

- Which are the most dangerous sports?
- Do most injuries occur in training or competition?
- Which are the most common injuries across sports?

To be able to answer these questions reliably, the terms 'incidence' or 'prevalence' are used.

Incidence describes the rate of injuries in a given time frame, in a given population. It is usually expressed as new injuries sustained per 1000 hours of participation time. For example, if a marathon runner trains for 52 weeks of the year at 10 hours per week, this gives them an injury exposure time of 520 hours. If they sustain 5 injuries in this time frame the incidence is 9.62 injuries per 1000 hours participation (5 ÷ 520 x 1000).

The incidence calculation can also be used to accurately inform of injuries in training versus competition, across levels of participation (Bronner, Ojofeitimi and Mayers, 2006). It can also be used to look at specific injuries, for example, anterior cruciate ligament (ACL) sprains in skiing. Looking at sports injury incidence allows like-for-like injury comparison across sports without participation rate bias. Soccer carries the highest risk of sport injury because more people participate in this sport (Bahr and Mæhlum, 2004).

Stop and think

A team of 16 soccer players trains for 8 hours a week during a 40-week season. If the team sustains 46 injuries, what is the incidence of injury?

The term **prevalence** describes the percentage of athletes in a given population that have a sports injury at a given time. For example if you were working with a tennis club and 5 out of the 50 club players reported lateral elbow pain the prevalence would be 10 per cent. The term incidence is best suited to describing acute injuries, while prevalence is best suited to describe occurrence of overuse injuries.

Classification of sports injuries

There are many ways to classify sports injuries based on the time taken for the tissues to become injured, tissue type affected, severity of the injury, and which injury the individual presents with.

Acute versus overuse

This is one of the most common methods of classifying sports injuries, and relies on the sports therapist knowing the mechanism of injury and the onset of the symptoms. Acute injuries occur due to sudden trauma to the tissue, with the symptoms of acute injuries presenting themselves almost immediately. These are the injuries that most of us have seen while watching sport and a player requires medical attention. An example of an acute injury is a hamstring strain in 100 metre sprinting. Common acute injuries include:

- sprains
- strains
- fractures
- dislocations.

Overuse injuries are not so pervasive and represent a greater challenge to a sports therapist in diagnosis and management (Brukner and Khan, 2006). Overuse injuries occur over a period of time, usually due to repetitive loading of the tissue, with symptoms presenting gradually. For example, an overuse injury common to marathon runners is illiotibial band (ITB) syndrome (Fredericson and Wolf, 2005). In contrast to acute injuries, the cause of overuse injuries is much less obvious. Common overuse injuries include:

- patello femoral joint dysfunction
- medial tibial stress syndrome
- iliotibial band syndrome

Distinguishing between overuse and acute injuries can be difficult. For example, delayed onset muscle soreness (DOMS) and blisters are overuse injuries due to the mechanism of injury, although their symptoms present relatively quickly.

Tissue type

Sports injuries can be classified according to which tissue has become damaged. This allows sports therapists to identify soft, hard, and special tissue injuries. On occasion however, a sports injury can damage more than one tissue type, for example, a poor tackle in soccer could lead to an open fracture affecting all tissue types (see Table 2.1).

Table 2.1: The different types of tissue injury and examples of anatomical structures

Tissue type	Examples
Soft	muscle ligament tendon skin deep fascia fibrocartilage
Hard	bone joints articular cartilage
Special	brain peripheral nerves eyes nose sinuses organs teeth blood vessels

Using this classification method shown in Table 2.1 clasify:

- a muscle strain is a soft tissue injury
- a fracture is a hard tissue injury
- a concussion is a special tissue injury.

Severity

Most sports injuries require a period of time where participation is reduced or ceased due to symptoms. Therefore sports injuries can also be classified relating to how long the symptoms present themselves for. This classification method allows a sports therapist to describe injuries as mild, moderate, and severe:

- Mild injuries usually last for 1–7 days, and include haematoma (see Figure 2.1), blisters, and DOMS.
- Moderate injuries usually last for 8–20 days, and include low-grade muscle strains and ligaments sprains.
- Severe injuries usually last for 21 days but can lead to permanent damage. Examples of severe injures are fractures and high grade strains and sprains.

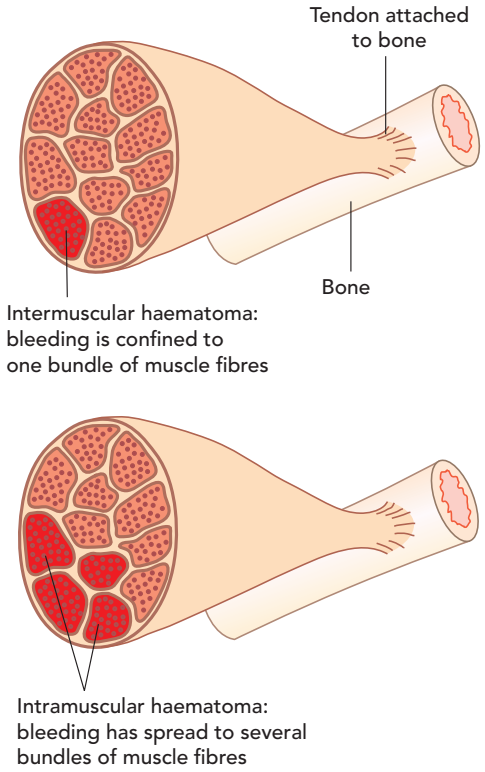


Figure 2.1: Types of haematoma

Primary consequential versus secondary non-consequential

An individual may sustain further injury as a result of being injured. An individual could get lower back pain due to the change of posture caused by limping because of a lateral collateral ligament (LCL) sprain (see Lewis, Schwellnus and Sole (2000) for more information on the aetiology and clinical features of low back pain in distance runners). In this example, the primary injury is the LCL sprain. The lower back pain was caused as a result of the original injury, so it is the secondary injury. A sports therapist can reduce the occurrence of secondary injury by:

- promoting good posture and gait
- carefully planning rehabilitation programmes and goals
- not allowing individuals to return to sport before the tissues are fully healed
- correctly adjusting crutches and fitting of braces and tape.

See Emery, Rose, McAllister and Meeuwisse (2007) and Kroll, Neri and Ho (2007) for examples of injury prevention strategies.

Common causes of sports injuries

To be able to effectively diagnose, rehabilitate, and ultimately prevent subsequent injury a sports therapist should understand the **aetiology** of the sports injury.

Key term

Aetiology – the causes or mechanism of injury

Identifying the exact cause of an injury can represent a significant challenge as the aetiology is not always obvious. The same injury sustained in two different individuals can also have completely different aetiology. For example, ITB syndrome could be caused by inappropriate footwear for participation or excessive downhill running or a leg length discrepancy. Finding the cause of a sports injury requires you to have detailed understanding of:

- the physical demands of the sport/exercise
- the psychological demands of the sport/exercise
- the appropriate equipment that should be used
- the surface of competition and/or training
- the individual's training: frequency, intensity, duration, and type.

Essentially sports injuries are caused by intrinsic factors and extrinsic factors (Baher and Holme, 2003).

Key intrinsic causes of sports injury

An intrinsic factor relates to the individual's inherent internal anatomical and pathological make-up.

Key extrinsic causes of sports injury

An extrinsic factor relates to various external or environmental factors relating to training/competition such as equipment, facilities or training methods.

Table 2.2: Intrinsic cause of injury

Anatomical factors	Relate to the make-up of the body. Leg length differences and body misalignment can lead to unequal forces being transferred to the tissues of the ankle, knee, hip, and back. An excessive quadriceps angle (Q-angle) can put strain on the ligaments of ankle and knee joints. Laxity of joints can lead to unnatural and often harmful movement leading to injury. Be aware that the laxity of a female's joints can increase when she is pregnant.
Physiological factors	Relate to how the body operates and facilitates movement. Injury can occur due to early onset of fatigue when a fatigued muscle cannot produce the same power and speed as a non-fatigued muscle even though the physiological demands placed upon it may not change. Reduced flexibility can lead to tight muscles that when overstretched exceed their ability and strain. Hyper-flexibility can allow harmful movements such as hyperextension. Muscle weakness or imbalance can lead to a discrepancy between agonist and antagonist in sporting movements and can place excessive strain on the body's soft tissue.
Individual difference factors	Specific to each individual and their medical history. Previous injuries and conditions can make a person more at risk of injury: tissues may not have healed effectively or returned to a non-damaged state. For example, ligament injuries; some athletes have a recurrent sprain in the same ankle or knee throughout their career.
Age factors	As the body ages it alters: less able to produce force, recovers slower, and soft tissues lose ability to stretch. An ageing body with demands of sport/exercise placed upon it can fail. A young, growing body can also be at risk of injury as tissues develop at different rates and cannot withstand strain placed upon them. For example overuse injuries are common in young athletes for this reason, e.g. shin splints and Osgood-Schlatter disease.

Table 2.3: Extrinsic cause of injury

Training-related factors	Relate to design of training programmes. Excessive repetitive loading of the tissues is needed for successful adaptation, however, without suitable recovery, tissues never have the chance to adapt and can fail. Sudden increase in frequency, intensity and duration, or simply changing training method can go beyond the tissues fail tolerance level leading to increased risk of injury. Performing techniques poorly can also place excessive strain on tissues. For example, poor shot technique in tennis increases the risk of tennis elbow.
Equipment selection factors	Relate to the suitability of equipment. Incorrect footwear will not protect the foot and ankle adequately nor distribute forces effectively, leading to an increased risk of injury. Not adhering to PPE rules place individuals under increased risk of injury. Training or competing with equipment that is not the correct size or weight can make movements biomechanically inefficient and put tissues under strain.
Environmental factors	Include environmental temperature and the surface participation takes place on. Surfaces that are too hard or too soft can lead to excessive forces going through the body or lead to a greater risk of sprains, e.g. feet/legs stuck in wet turf. Uneven surfaces, such as cambered paths or roads, can increase forces placed through one side of the body.
Psychological factors	Relate to the psychological demands of training/competition and how individuals respond to these demands. Being over- or under-aroused can lead to poor decision making and possible injury. When competing individuals can become over assertive or aggressive which can lead to them harming themselves or others. See *Chapter 12: Psychology of sports injuries* for more information.
Nutritional factors	Include adequate glycogen stores, hydration and protein intake. Adequate glycogen stores reduce the time taken to become fatigued. Correct hydration reduces the effect of dehydration, prevents **hyponatremia** and overheating of the body. Without correct protein intake, an individual's soft tissue may not recover or adapt properly, and can lead to DOMS and overtraining syndrome.

Key term

Hyponatremia – a state of low plasma sodium concentration in the blood

More often than not a sports injury is the result of a number of inter-related factors. Intrinsic factors can lead to a predisposition to sports injury that when combined with exposure to extrinsic factors leads to sports injury. Figure 2.2 below explains how sports injuries could be caused.

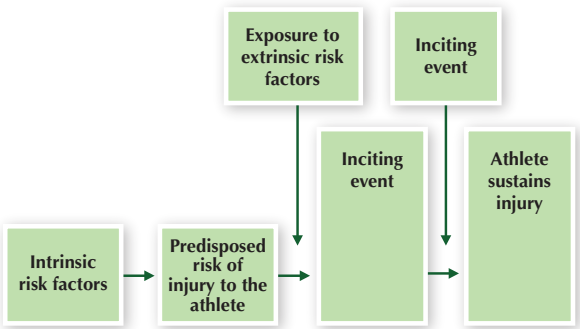


Figure 2.2: Injury aetiology and mechanism model demonstrating how intrinsic and extrinsic risk factors contribute to sports injury. (Adapted from Meeuwisse (1994))

Preventing sports injuries

One of the most important roles of sports therapists is preventing sports injuries and the physical, mental, social and financial harm that accompanies them. Primary preventative measures aim to reduce the occurrence of any injury within a sport/exercise. Secondary preventative measures relate to the sports therapist examining the injured athlete to work out how to reduce the risk of subsequent or secondary injuries. Any approach to preventing injury in an individual or team context should be sequential and follow the stages as shown in Figure 2.3 below.

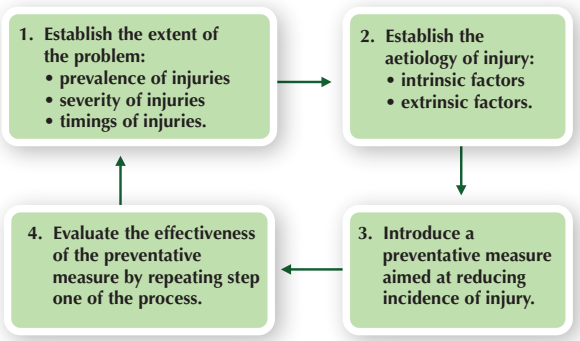


Figure 2.3: The sequential approach to preventing sports injury

There are general preventative measures that a sports therapist can use: they should be applied to the specific sport or exercise the individual participates in. For example, the personal protective equipment needed in boxing is completely different from that needed in soccer.

Warm-up and cool-down

A well-structured warm-up and cool-down is necessary to either prepare the individual physically and mentally or aid recovery from sport/exercise.

A good warm-up:

- increases blood and nutrient flow to the muscles
- improves neuromuscular functioning
- disperses **synovial fluid** across joints aiding movement
- mirrors sport-specific movements
- increases concentration.

A good cool-down:

- promotes **venous return**
- lactate removal
- improves flexibility
- improves relaxation.

Key terms

Synovial fluid – fluid within synovial joints that lubricates the joint

Venous return – the flow of blood back to the heart

Plyometric – a form of power training that involves eccentric actions followed by rapid concentric actions

Planning a session

You should plan any training or rehabilitation programme carefully considering frequency, intensity, duration, and type of training method. If programmes are carefully periodised it allows a gradual specific adaptation to imposed demands (SAID) and reduces damage to the tissues as a result of training (Whyte, 2006). Planned active or passive recovery allows tissue to repair themselves without injury. Between competition or high-intensity training such as **plyometric** work, individuals need more recovery in comparison to low-moderate intensity training (Whyte, 2006).

Training and competition should take place on an appropriate surface that allows for the demands of the sport to be met and reduces the forces going through the body. A risk assessment should be conducted on all training environments to identify risk and hazards and look to reduce these. For more details of how to conduct a risk assessment see *Chapter 12: Ethics and safety*. A technical observation of athletes to ensure skills/techniques are performed safely and effectively will also reduce injury risk. *Chapter 7: Training and conditioning* discusses training programme design in more detail.

Protective equipment

The use of protective equipment varies across different sports and exercises. The general purpose of protective equipment is to prevent harmful movements, reduce or disperse shock and force, and act as a shield to block force. Key pieces of protective equipment are footwear, helmets, goggles, gum shields, shin pads, gloves, bindings, and shoulder pads. It is common for athletes who have been previously injured to require bracing or taping of joints as an important secondary preventative measure to restrict harmful movements.

Adherence to the rules

If all performers are aware of and adhere to the rules and laws of the game then injuries can be reduced. This means that aggressor and victim will hopefully not sustain injury. Individuals should be coached in the differences between assertion and aggression to limit injuries.

Regular fitness testing

All participants in a sport should be able meet the demands of that sport or exercise. Individuals must be fit enough to train or compete, otherwise their tissues can fail. Regular fitness testing will ensure individuals have the basic fitness to participate safely and effectively. The use of field-based and laboratory-based testing can highlight any weaknesses in individuals that may lead to injury.

Psychological training

Some form of mental skills training and practice could reduce injury by reducing anxiety, improving attentional focus and allowing an athlete to achieve optimal arousal for their sport. *Chapter 11: Psychology of Sports Injury* discusses psychological training in more detail.

Meeting nutritional requirements

Active individuals have increased nutritional requirements to meet extra energy, hydration and recovery needs. Increasing carbohydrate, fluid, and protein intake can play an important role in injury prevention by delaying fatigue and promoting recovery. Certain supplements can promote recovery and maintain joint health, however, their value needs further empirical evidence (Goggs et al., 2005).

Common causes of sports injuries

There are a number of common sports injuries where a full understanding will help you to become a more effective professional. Each sport has its own common injuries and they are largely based on the physical demands of the sport. For example, in a sport like basketball where explosive movements and sudden changes in direction are needed, strains and sprains are common (Starkey, 2000). Table 2.4 explains key sports injuries.

Stop and think

Look at Table 2.4 to answer the following questions.

- Which do you think are overuse injuries and which are acute injuries, and why?
- Which injuries do you think require hospital treatment, and why?

Table 2.4: Common sport- and exercise-related injuries

Sports injury	Description	Likely aetiology
Haematoma	Bleeding under the skin or bruising. Can occur within muscle (intramuscular) or between the tissues (intermuscular).	Most likely caused by a direct blow damaging the blood vessels in a local area.
Strain	Tearing of muscle fibres with pain, swelling and loss of muscle strength evident. Graded I–III based on severity of symptoms and fibres torn; Grade III is a complete tear of the muscle.	Muscle fibres fail to cope with the demands placed upon them. Muscle are likely to tear via overstretching, or rapid acceleration/ deceleration.
Sprain	A partial or complete tear of a ligament with symptoms of pain, swelling, bruising, loss of function, and often an audible 'popping sound'. They are graded I–III based on number of fibres torn; Grade III is a total rupture.	Usually caused by a direct trauma to a joint such as a tackle. Can be caused indirectly by twisting or falling in the absence of a blow or collision.
Fracture	A crack or full break in bone/s. Can be closed or open where the bone punctures the skin. Have symptoms of intense pain, loss of function, swelling, bruising, and possible deformity.	Caused by direct trauma such as a blow, or indirect trauma such as falling and breaking the fall with the wrist.
Dislocation	Partial (subluxation) or total (luxation) separation of a joint. Most commonly affects ball and socket joints. Symptoms include pain, bruising, swelling, loss of function, and deformity.	Caused by a direct blow or trauma which forces the joint to separate.
Concussion	A head injury with a temporary loss of brain function, concussion can cause a variety of physical, cognitive, and emotional symptoms.	Caused by a direct blow or collision to the head.
Contusions	Local muscle damage and bleeding with accompanying swelling and pain. Contusion to anterior thigh is known as a 'dead leg'.	Usually a direct blow from an opponent or contact with equipment in collision.
Tendinopathy	Refers to a range of tendon injuries with associated local pain upon movement. Common sites are patella, rotator cuff, wrist flexor, and Achilles tendons.	Excessive repetitive use of joints such as jumping, running, and throwing.
Bursitis	Inflammation of the bursa, usually in shoulder, hip, and heel. Symptoms of local tenderness, pain, and swelling are common.	Usually associated with overuse of joints, however can be caused by trauma to a joint. Can be a common secondary injury.
Plantar fasciitis	Pain, and sometimes inflammation of the plantar fascia (underside of the foot) which support the foot arch.	Usually caused by repetitive running-based training on hard ground, poor footwear, and poor foot biomechanics.
Stress fracture	A microfracture in bone, usually tibia, leading to localised pain and tenderness.	Excessive overload stress caused by large impact forces or repetitive action of muscles pulling across the bone.
ITB syndrome	Tightness of the ITB leading to pain which can be located from hip to lateral knee. Often made worse by running or eccentric activities such as walking down stairs.	Usually caused by repetitive use of quadriceps muscles without adequate rest. Other causes are the use of poor footwear on hard ground, biomechanical inefficiencies such as pronation, and hill running.
DOMS	Muscle soreness developing 24–48 hours after exertion. Symptoms are more severe after eccentric exercise.	Excessive overloading and over-reaching during training and competition.

How the body reacts to injury

The inflammatory process is the body's response to being injured. The inflammatory process has three main stages: the inflammatory stage, the proliferative phase and the maturation phase.

The inflammatory stage

This stage lasts for three to five days. Inflammation is a local response to cell damage within a tissue and is a chain of events that helps the body to repair, re-form, or form new scar tissue. Inflammation from sports injuries can be caused by excess pressure, friction, overload, over-stretching or impact trauma. There are five main signs and symptoms:

1. **Pain:** due to an increase in pressure in the injured area and damage that has been caused to local nerve fibres (nociceptors) from the swelling
2. **Swelling:** due to the bleeding from torn blood vessels and tissue fluid leaving the cells surrounding the injury
3. **Redness or discoloration:** due to the **vasodilation** of nearby undamaged blood vessels
4. **Heat:** due to the dilation of blood vessels, and thus local area circulation, around the injury site
5. **Loss of function:** due to the pain and swelling caused by the injury. Function maybe reduced or lost totally, including the inability to bear any weight on injured limbs.

The signs and symptoms of inflammation are related to the degree of injury. The higher the degree of injury, the greater the signs and symptoms of inflammation will be. This stage is also known as the acute stage.

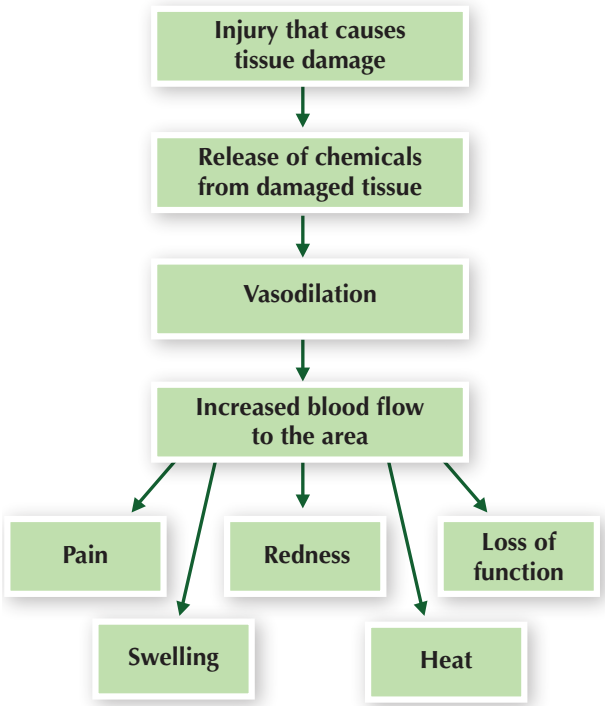


Figure 2.4: Signs and symptoms of inflammation. Why does the body react to injury in this way?

Your main role as the sports therapist in this stage is to control the inflammation. Increased vascular activity over a prolonged period of time slows the rate of repair and can increase the risk of secondary **hypoxic** death of previously undamaged tissue (Brukner and Khan, 2006), so sustained inflammation does not aid effective recovery. During this stage you will be expected to give immediate treatment and advice.

The proliferative stage

This stage lasts for two to five weeks and is the phase of healing where new tissue is laid down at the site of injury. This early repair work is characterised by a new network of capillaries and **lymphatics** being developed, which means that the injury site now has improved circulation and drainage. After this, there is a rapid production of **fibroblasts** at the injury site which develop in the connective tissues, and are responsible for repair. Fibroblasts are the precursors to collagen, elastic fibres and reticular fibres and over the coming weeks the new tissue increases in strength as the

Key terms

Vasodilation – an increase in the diameter of blood vessels that results in an increased blood flow

Hypoxia – reduced pressure of inspired oxygen, thus reducing the amount of oxygen being sent to the tissues

Lymphatic system – a network of vessels that carries lymph

Lymph – a fluid that carries water, electrolytes and proteins from the tissues

Fibroblasts – a cell in connective tissue

collagen fibres start to form cross links between each other. This stage is also known as the early repair stage, cellular proliferation stage or the sub-acute stage.

Your main role as the sports therapist during this stage is to help develop mobility exercises with your client within a safe and pain-free range. As the injury is still in a stage of repair, carefully monitor the rehabilitation of your client and make sure that you avoid any excess stress on the injured tissue as this could lead to re-injury (see *Chapter 5: Sports rehabilitation*).

The maturation stage

This stage can last from around three weeks up to a period of months and is the final phase where the repairing tissue gains strength as a result of the increased structural organisation (although at the start of this phase, the organisation of tissue is rather haphazard). This stage is also known as the subsequent or consolidation stage. Your main role as the sports therapist through this stage is to increase the level of rehabilitation, including more mobility, strengthening, flexibility, power and **proprioception** work which are all essential for the long-term functional rehabilitation of repairing tissue (see *Chapter 5: Sports rehabilitation*).

Key terms

Proprioception – the body's ability to sense movements within joints and joint positions

Progress – an injury getting better

Regress – an injury getting worse

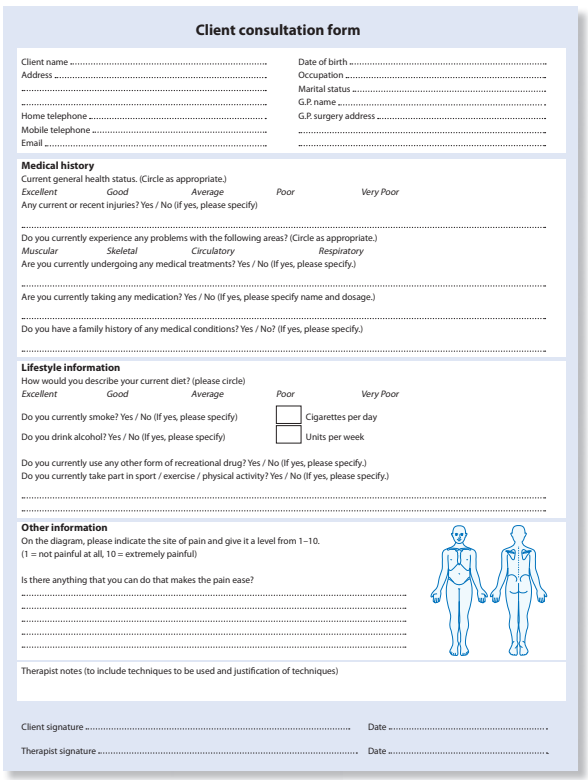
Key principles of sports injury assessment

Injury evaluation is the first stage of treating the injury. As a sports therapist make sure that you know what you are working with before you attempt to advise, treat or rehabilitate your client. When assessing clients you will go through two processes: subjective assessment and objective assessment.

Subjective assessment

Subjective assessment of your client is the 'history taking' stage of the assessment where the client describes their injury. It is always the first stage of any client evaluation and precedes any objective testing. However, you must try to get your client to be as clear as possible with the information that they give. This is called the subjective stage because the client is offering you information about the injury – such as how the injury has **progressed** or **regressed** since it first occurred or how much pain they have been in – you cannot be certain of the accuracy of this information as people might over-exaggerate or play down the significance of an injury.

Ask your client to elaborate on any points raised through the subjective assessment that you consider to be important for the treatment and management of the injury.



Client consultation form

Client name ..... Date of birth .....
Address ..... Occupation .....
..... Marital status .....
..... G.P. name .....
Home telephone ..... G.P. surgery address .....
Mobile telephone .....
Email .....

Medical history
Current general health status. (Circle as appropriate.)
Excellent *Good* *Average* *Poor* *Very Poor*
Any current or recent injuries? Yes / No (if yes, please specify)
.....
Do you currently experience any problems with the following areas? (Circle as appropriate.)
Muscular *Skeletal* *Circulatory* *Respiratory*
Are you currently undergoing any medical treatments? Yes / No (If yes, please specify.)
.....
Are you currently taking any medication? Yes / No (If yes, please specify name and dosage.)
.....
Do you have a family history of any medical conditions? Yes / No? (If yes, please specify.)
.....

Lifestyle information
How would you describe your current diet? (please circle)
Excellent *Good* *Average* *Poor* *Very Poor*
Do you currently smoke? Yes / No (If yes, please specify) ☐ Cigarettes per day
Do you drink alcohol? Yes / No (If yes, please specify) ☐ Units per week
Do you currently use any other form of recreational drug? Yes / No (If yes, please specify.)
Do you currently take part in sport / exercise / physical activity? Yes / No (If yes, please specify.)
.....
.....

Other information
On the diagram, please indicate the site of pain and give it a level from 1–10.
(1 = not painful at all, 10 = extremely painful)
Is there anything that you can do that makes the pain ease?
.....
.....
.....
.....
.....

Therapist notes (to include techniques to be used and justification of techniques)

Client signature ..... Date .....
Therapist signature ..... Date .....

Figure 2.5: Client consultation form

Below are some suggestions for questions to ask when conducting a subjective assessment of your client, although the questions will be determined by your client's activities.

- How and when did the injury happen?
- Onset of injury. Was it sudden? Trauma?
- What were the surface/ground conditions like?
- Current signs and symptoms?

- What problems does the injury currently cause you? Are they performance related? Do they affect everyday life?
- Does anything make the symptoms better/worse?
- Do you have any pain/discomfort? If yes, locality? Type of pain? Local/referred? Constant/intermittent? What has happened with pain over last 24 hours?
- Are you taking any medication?
- General health? Recent weight loss/gains and reasons? Previous conditions? Previous injury?
- Red, yellow, blue, black, orange flags/precautions.

Objective assessment

The objective assessment is where you collect information about the injury by looking at the injury site, **palpation**, observing specific functional movements and completing any specific tests. Your aim during this stage of assessment is to determine the degree of functional losses and gains during the injury period. For more information on joint specific objective assessment, see Brukner and Khan (2006).

Observation

You will gain a better picture of the injury status if you can observe the client (and particularly the affected part) performing different types of movements. This allows you to assess progression/regression in the injury. Consider the following aspects where possible and appropriate:

- watch the player walk into your clinic or off the field – is there a limp?
- functional ability sitting/standing
- undressing/redressing items of clothing specific to the injury site.

Whether your client is standing, seated or lying, always look for and assess:

- muscle wastage
- swelling and the degree of swelling
- any previous scars
- any general lumps, cysts, bursae
- discoloration
- postural considerations (see *Chapter 5: Sports rehabilitation*)
- position of the patella
- foot position (flat, pronated, supinated?).

Palpation

Palpation is a key part of the objective assessment. When you examine your client using palpation they could be standing, sitting or lying (**prone** and **supine**). This part of the consultation has two parts: a general assessment of the tissues within the area and precise palpation to try to find areas of tension, sensitivity or any trigger points. When palpating your client you should include the following.

- Feel for heat using the back of your hand.
- Any swelling? Is it soft/hard?
- Pain? Degree of pain using pain scale (1–10). Area of pain? Type of pain?
- Palpate all bony points, ligaments, tendons, muscles, along joint lines.

Key terms

Palpation – physical assessment of tissues using precise touching and feeling

Prone – laying face down

Supine – laying down facing up

Remember

For lower limb injuries, always view the injury with the client standing if possible as this ensures weight bearing through limbs, and make sure that you view from anterior, posterior and lateral perspectives.

Always compare both sides of the body so that you can check for differences.

Movements

The final important part of your objective assessment is the movements that your client can perform. Three types of movement are used to assess the injury status: active, passive and resisted.

- Active movements are movements performed by the client.
- Passive movements are movements performed by the sports therapist (e.g. manually flexing the leg of the client at the knee).
- Resisted movements are movements performed by the client and resisted by the sports therapist.

When using these different types of movement with your client, your client should be tested through a 'pain free' movement. Consider some of these questions when working with your client:

- What range of movement is achieved pain free?
- What is the limiting factor in preventing movement?
- How does the movement gained compare to the uninjured side?

Specific testing

As part of your injury evaluation, you will need to conduct different tests to give you a better idea of the progression or regression of the injury. The tests used by sports therapists to assess injury status include range of movement testing, gait analysis, manual muscle tests and ligament stress tests.

Range of movement testing

Range of movement testing is an important part of the objective assessment as marked restrictions in movement should encourage the sports therapist to examine the injury condition further and consider possible causes (e.g. pain, swelling, muscle spasm.

Range of movement testing can be active or passive. In active range of movement testing ask your client to perform active range of movement exercises that allow you to look for restrictions in movement, the point of onset of pain or any abnormal movement patterns. Passive range of movement testing is used to bring out joint or muscle stiffness. This can be important for identifying injuries as the injury may be the cause of stiffness, or the stiffness may result in the injury. Range of movement testing should include all directions that are appropriate to a particular joint and slight over-pressure can be used at the end of the range of movement if you need to elicit your client's symptoms.

When conducting range of movement testing, compare your client's range of movement to the established norms (allowing a few degrees either side). Table 2.5 shows range of movement for different joints. Range of movement is often tested using a **goniometer**, although experienced sports therapists are often able to assess range of movement simply with a keen eye.

Key term

Goniometer – a device used to measure different joint angles

Table 2.5: Norms for range of movement at different joints

Joint	Range of Movement
Cervical	Flexion 45° Hyperextension 45° Rotation 75° Lateral flexion 50°
Shoulder	Flexion 170° Hyperextension 50° Abduction 175° Adduction 180° Medial rotation 75° Lateral rotation 90° Horizontal abduction 30° Horizontal adduction 120°
Elbow	Flexion 145° Extension 145 – 0°
Radio - Ulnar	Pronation 90° Supination 85°
Wrist	Flexion 85° Hyperextension 75° Radial deviation 25° Ulnar deviation 30°
Hip	Flexion 125° Hyperextension 20° Abduction 45° Adduction 25° Medial rotation 45° Lateral rotation 45°
Knee	Flexion 130° Extension 130 – 0°
Ankle	Dorsiflexion 20° Plantarflexion 45°
Foot	Inversion 30° Eversion 25°

Gait analysis

Gait analysis is a worthwhile procedure as an abnormal gait is usually a risk factor in injury or as a result of injury. Gait analysis is conducted most simply by observing or recording your client from anterior, posterior and lateral viewpoints so that gait patterns can be observed. In more sophisticated clinical settings, gait can be analysed using force plates that will provide ground reaction forces at

different points of the gait. When conducting gait analysis with your client, they should be wearing shorts and should be measured barefoot and in trainers. If your client uses **orthotics** they should be observed walking with and without the orthotics.

As well as watching your client walk as part of the gait analysis examine the feet for pressure signs such as calluses, corns and blisters. Examine footwear for signs of uneven wear and suitability to the activity and examine feet for any signs of biomechanical abnormalities such as **pes planus**, **pes cavus**, **hallux valgus**, **varus** or **valgus** heels.

Key terms

Orthotics – corrective insoles that can either be purchased over the counter or made by prescription, used to correct gait problems Pes planus – flat foot

Pes planus – being flat footed with no noticable arch

Pes cavus – having a high foot arch

Hallux valgus – bunions

Varus – the position in which a body segment is bowed medially

Valgus – the position in which a body segment is bowed laterally

In most clients, painful gait is easy to identify as the client will have a pronounced limp, with the client taking their weight off the affected limb as quickly as possible or making a shorter stride on the affected limb. If a client has a stiff leg gait, they may abduct the leg at the hip when walking.

Manual muscle tests

These tests examine the strength of the affected and unaffected muscles and muscle groups. In manual muscle tests the client often performs isometric muscle actions against the sports therapist's resistance and the muscle is usually tested at the mid-point of movement, although isotonic muscle actions can also be tested if you wish to examine the client's functional test. The muscle contractions are normally held for approximately five seconds and repeated a few times so that the sports therapist can assess the level of weakening. This is an important element of the objective assessment as muscle weakness often accompanies injury in a given area (Hough, Lieu and Caldwell, 2011).

When conducting manual muscle testing look at the strength of contraction using a simple scale:

0 – no contraction
1 – slight contraction – trace
2 – weak contraction – poor
3 – weak contraction – fair
4 – normal contraction – good
5 – strong contraction – very good

As well as assessing the degree of strength, record if and where the client reports any pain. Observe and palpate the muscle at the same time as it is being tested.

Ligament stress test

Ligaments should be assessed for laxity and pain as part of the objective assessment. Ligament stress tests are tests that place a longitudinal stress along the length of the ligament and are often combined with palpation of the area, particularly around the insertion sites of the affected ligaments. There are a number of specific tests that have been devised for all of the major ligaments, such as the **Lachman's test** and **Anterior Drawer** test which have been identified to asses the condition of the anterior cruciate ligament (Day, Fox and Paul-Taylor, 2009). Usually, ligament laxity is graded as +1 (mild), +2 (moderate) and +3 (severe) (Bloomfield, Fricker and Fitch, 1995).

Remember

Always tell your client what you are doing and why you are doing it – communication is essential to make your client feel at ease.

Key terms

Lachman's test – a test performed with the knee in 15° flexion where the examiner draws the tibia forward, assessing the joint for laxity

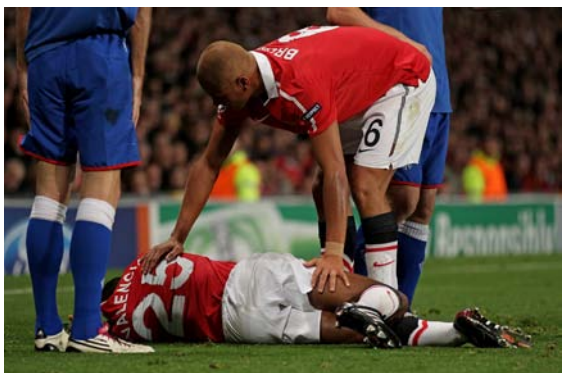
Anterior drawer test – a test performed with the knee in 90° flexion and the client's foot kept stable. The tibia is drawn forward and the joint is assessed for degree of movement and quality of end point

Activity

You are working with an athletics club which has had a number of injuries among their youth athletes. The athletes that have been injured are mainly representing the club in either 100 m sprint, triple jump, discus and 10,000 m. As a result of this, you have decided to investigate the sports further so that you can get a greater understanding of the different impacts of the sports on injury occurrence. In order to do this, answer the following questions.

1. What are the physical, physiological and psychological demands of each of the different events?
2. What are the likely causes of injury that are associated with each of the different events?
3. What are the different types of injury that are likely to occur in the different events?
4. What are the key preventative measures that can be put in place for these different events?

Case study



A serious injury that is often suffered by footballers and rugby players is a twist (sprain) of the ankle or knee. This type of ankle injury can be relatively minor or can lead to other tissues becoming damaged, such as fracture or dislocation in the most severe cases.

This type of injury was suffered by England Rugby international Danny Cipriani in 2008, Croatian footballer Eduardo, in 2008 and England footballer Alan Smith in 2006.

Questions

1. What do you think are the mechanisms of this type of injury?
2. What will be the signs and symptoms of injury?
3. What will be the body's response to injury?
4. What preventative measures (if any) could be put in place?
5. How would you tackle assessing such a serious and sensitive injury?
6. What are your limitations of practice in this case?

Check your understanding

1. Give a definition of sports injury.
2. Why might soccer have the highest rate of injury across the world?
3. How would you classify a hamstring strain caused by sudden acceleration in 100 m sprinting?
4. What is the difference between an intrinsic and extrinsic risk factor?
5. List five extrinsic risk factors of injury associated with cricket.
6. What is the difference between an overuse injury and an acute injury?
7. How can regular fitness testing prevent sports injuries?
8. Name three common injuries a rugby union player could sustain.
9. What are the key stages of the inflammatory process?
10. Why would you use subjective and objective assessment together?

To obtain answers to these questions visit the companion website at www.pearsonfe.co.uk/foundationsinsport

Useful resources

To obtain a secure link to the websites below, see the Websites section on page ii or visit the companion website at www.pearsonfe.co.uk/foundationsinsport.

British Journal of Sports Medicine
Virtual Sports Injury Clinic
Sports Injury Bulletin
SportEx Medicine

Further reading

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