Introduction to sports injury and assessment

Introduction

Regular participation in sport and exercise has positive physical, mental, and social health enhancing properties. According to research these benefits include:

• improved quality of life and vigour
• reduced risk of chronic disease such as CVD, diabetes, obesity, and depression
• improved longevity
• maintenance of independence into older age

Regular participation in sport and exercise can also have a detrimental effect on health in the form of injury. The effects that sport and exercise related injuries have on an individual’s health can be relatively minor, with a period of rest needed, or more profound resulting in athletes having to retire from their careers. Sport and exercise related injuries do not just effect 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 out weighs 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.
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. Definitions of sports injury are not consistent. In this chapter a sports injury is defined as any damage to the 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 whilst 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 this marathon runner sustains 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. It can also be used to look at specific injuries, for example, ACL sprains in skiing. Looking at sports injury incidence allows like-for-like injury comparison across sports without participation rate bias. Soccer carries the most risk of sport injury because more people participate in this sport.

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%. The term incidence is best suited to describing acute injuries, whilst prevalence is best suited to describe occurrence of overuse injuries.

Classification of sports injuries

There are many ways to classify sports injuries based on 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 whilst 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. 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 iliotibial band (ITB) syndrome caused by repetitive loading of the quadriceps. In contrast to acute injuries, the cause of overuse injuries is much less obvious. Common overuse injuries include:

- osteoarthritis
- bursitis
- tendinopathy.

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 3.1).

Using this classification method:
- 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 their symptoms. Therefore sports injuries can also be classified relating to how long the symptoms present themselves. This classification method allows sports therapists to describe injuries as mild, moderate, and severe:

- Mild injuries usually last for 1–7 days, and include haematoma, 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 injuries are fractures and high grade strains and sprains.

### Tissue type

<table>
<thead>
<tr>
<th>Tissue type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft</td>
<td>muscle, ligament, tendon, skin, deep fascia, fibrocartilage</td>
</tr>
<tr>
<td>Hard</td>
<td>bone, joints, articular cartilage</td>
</tr>
<tr>
<td>Special</td>
<td>brain, peripheral nerves, eyes, nose, sinuses, organs, teeth, blood vessels</td>
</tr>
</tbody>
</table>

Table 3.1: The different types of tissue injury and examples of anatomical structures

Figure 3.1: Types of haematoma
Primary consequential versus secondary non-consequential

It is not unusual for an individual to sustain further injury as a result of being injured. For example, an individual could get lower back pain due to changing their posture as they are limping because of a LCL sprain. In this example, the primary injury is the LCL sprain as it is the original injury. 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.

Essentially sports injuries are caused by intrinsic factors and extrinsic factors:

• An intrinsic factor relates to the individual’s inherent anatomical and pathological makeup.
• An extrinsic factor relates to various environmental factors relating to training/competition.

Key intrinsic causes of sports injury

Anatomical factors

These factors relate to the genetic make up of the body. Leg length differences and misalignment of the body 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 the ankle and knee joints. The laxity of the joints can lead to unnatural and often harmful movement of the joints leading to injury. If you are working with anyone who is pregnant be aware that the laxity of a female’s joints increases when she is pregnant.

Physiological factors

These factors include those that relate to how the body operates and facilitates movement. Not being able to meet the physiological demands of the sport/exercise can lead to injury due to the early onset of fatigue. For example a fatigued muscle can’t produce the same power and speed as a non-fatigued muscle even though the physiological demands placed upon them doesn’t change in competition. Having reduced or hyper-flexibility can either lead to tight muscles that when overstretched exceed their ability and strain, or allow harmful movements such as hyperextension. Muscle weakness or imbalance can lead to a discrepancy between agonist and antagonist in sporting movements and gain can place excessive strain on the body’s soft tissue.

Individual difference factors

These factors are specific to a person and therefore vary from one individual to the next. The medical history of an individual must be identified in order for injury-free training or competition to take place, as the strains placed on the individual’s physiological system are increased. It is not uncommon for an individual’s injury history to make them more at risk of injury as tissues may not have healed effectively or returned to their non-damaged state. A classic example of this is ligament injuries; some athletes have a recurrent strain in the same ankle or knee throughout their career.

Age factors

As your body ages it alters to be less able to produce force, recovers slower, and soft tissues lose their ability to stretch. An ageing body with the demands of sport/exercise placed upon them can easily fail. A young body that is still growing can be at risk of injury as tissues develop at different rates and can’t withstand the strain placed upon them. For example overuse injuries such as shin splints and Osgood Schlatters disease are common in young athletes for this reason.

Key extrinsic causes of sports injury

Training-related factors

These factors relate to the design of the training programme. 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 increases 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 sport and exercise specific techniques poorly can place excessive strain on tissues. For example, poor shot technique in tennis increases the risk of tennis elbow.

Environmental factors

These factors include the environmental temperature and the surface that participation takes place on. Training 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 because feet/legs can become stuck in wet turf. Uneven surfaces, such as cambered paths or roads, can lead to increased force being placed through one side of the body.

Psychological factors

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 becoming injured by making poor decisions. It is not uncommon for individuals to become over assertive or aggressive when competing which can lead to harming themselves or others. For a more in-depth discussion of the psychological determinants of injury see Chapter 12 Psychology of Sports Injuries.

Nutritional factors

These factors mainly encompass ensuring the athlete has adequate glycogen stores, hydration...
and protein intake. Having adequate glycogen stores reduces 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.

More often than not, sports injury is a 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 lead to sports injury. Figure 3.2 below explains how sports injuries could be caused.

Figure 3.2: Injury aetiology and mechanism model demonstrating how intrinsic and extrinsic risk factors contribute to sports injury. Adapted from Meeuwisse (1994)

Preventing sports injuries

A great deal of a sports therapist’s time is taken up with the assessment and treatment of sports injuries. However, one of the most important roles of sports therapists is preventing sports injuries. If you consider the physical, mental, social, and financial harm that is caused by sustaining a sports injury, it is clear that this is extremely important. Primary preventive measures relate to reducing the occurrence of any injury within a sport/exercise. Secondary preventive 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 3.3 below.

A good cool down:
• promotes venous return
• lactate removal
• improves flexibility
• improves relaxation.

Key term

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

Key term

 Venous return - the flow of blood back to the heart

Key term

Synovial fluid - fluid within synovial joints that lubricates the joint

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. 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. 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 13 Ethics and Safety. A technical observation of athletes to ensure skills/techniques are performed safely and effectively will also reduce injury risk. Chapter 8 Training and Conditioning discusses training programme design in more detail.

Meeting nutritional requirements

Any active individual has increased nutritional requirements because they need 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 good recovery. Certain supplements promote recovery and maintain joint health, however, their value needs further scientific research.

**Common sports injuries**

Although as a sports therapist you may come across a wide range of sports injuries there are a number of common sports injuries that if you fully understand will help you 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. Table 1 opposite explains key sports injuries:

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 of inflammation (see Figure 3.4):

- **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
- **Swelling:** due to the bleeding from torn blood vessels and tissue fluid leaving the cells surrounding the injury
- **Redness or discolouration:** due to the vasodilation of nearby undamaged blood vessels
- **Heat:** due to the dilation of blood vessels, and thus to the area
- **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.

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

### Signs and symptoms of inflammation

<table>
<thead>
<tr>
<th>Inflammation Stage</th>
<th>Signs and Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swelling</td>
<td>Redness, pain, heat</td>
</tr>
<tr>
<td>Redness</td>
<td>Swelling, pain, heat</td>
</tr>
<tr>
<td>Heat</td>
<td>Swelling, redness, pain</td>
</tr>
<tr>
<td>Loss of function</td>
<td>Swelling, redness, heat</td>
</tr>
<tr>
<td>Increased blood flow to the area</td>
<td>Swelling, redness, pain, heat</td>
</tr>
<tr>
<td>Vasodilation</td>
<td>Swelling, redness, pain</td>
</tr>
<tr>
<td>Release of chemicals from damaged tissue</td>
<td>Swelling, redness, pain</td>
</tr>
<tr>
<td>Injury that causes tissue damage</td>
<td>Swelling, redness, pain</td>
</tr>
</tbody>
</table>

**Injury that causes tissue damage**

**Release of chemicals from damaged tissue**

**Vasodilation**

**Increased blood flow to the area**

**Swelling**

**Redness**

**Loss of function**

**Pain**

**Stop and think**

Look at the table opposite to answer the following questions:

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

**Table 3.2: Common sports injuries and exercise related injuries**

<table>
<thead>
<tr>
<th>Sports Injury</th>
<th>Description</th>
<th>Likely Aetiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haematoma</td>
<td>Bleeding under the skin or bruising. Can occur within muscle (intramuscular) or between the tissues (intermuscular).</td>
<td>Most likely caused by a direct blow damaging the blood vessels in a local area.</td>
</tr>
<tr>
<td>Strain</td>
<td>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 I is a complete tear of the muscle.</td>
<td>Muscle fibres fail to cope with the demands placed upon them. Muscle are likely to tear via overstretching, or rapid acceleration/deceleration.</td>
</tr>
<tr>
<td>Sprain</td>
<td>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 complete tear.</td>
<td>Usually caused by a direct trauma to a joint such as a twist. Can be caused indirectly by twisting or falling in the absence of a blow or collision.</td>
</tr>
<tr>
<td>Fracture</td>
<td>A crack or full break in bones. Can be closed or open where the bone punctures the skin. Have symptoms of intense pain, loss of function, swelling, bruising, and possible deformity.</td>
<td>Caused by direct trauma such as a blow, or indirect trauma such as falling and breaking the fall with the wrist.</td>
</tr>
<tr>
<td>Dislocation</td>
<td>Partial (subluxation) or total (luxation) separation of a joint. Most commonly affects bail and socket joints. Symptoms include pain, bruising, swelling, loss of function, and deformity.</td>
<td>Usually caused by a direct blow or trauma which forces the joint to separate.</td>
</tr>
<tr>
<td>Concussion</td>
<td>A head injury with a temporary loss of brain function, concussion can cause a variety of physical, cognitive, and emotional symptoms.</td>
<td>Caused by a direct blow or collision to the head.</td>
</tr>
<tr>
<td>Contusions</td>
<td>Local muscle damage and bleeding with accompanying swelling and pain. Contusion to anterior thigh is known as a ‘dead leg’.</td>
<td>Usually a direct blow from an opponent or contact with equipment in collision.</td>
</tr>
<tr>
<td>Tendinopathy</td>
<td>Refers to a range of tendon injuries with associated local pain upon movement. Common sites are patella, rotator cuff, wrist flexor, and Achilles tendons.</td>
<td>Excessive repetitive use of joints such as jumping, running, and throwing.</td>
</tr>
<tr>
<td>Bursitis</td>
<td>Inflammation of the bursa, usually in shoulder, hip, and heel. Symptoms of local tenderness, pain, and swelling are common.</td>
<td>Usually associated with overuse of joints, however can be caused by trauma to a joint. Can be a common secondary injury.</td>
</tr>
<tr>
<td>Plantar Fasciitis</td>
<td>Pain, and sometimes inflammation of the plantar fascia (under side of the foot) which support the foot arch.</td>
<td>Usually caused by repetitive running-based training on hard ground, poor footwear, and poor foot biomechanics.</td>
</tr>
<tr>
<td>Stress fracture</td>
<td>A microfracture in bone, usually tibia, leading to localised pain and tenderness.</td>
<td>Excessive overload stress caused by large impact forces or repetitive action of muscles pulling across the bone.</td>
</tr>
<tr>
<td>ITB Syndrome</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>DOMS</td>
<td>Muscle soreness developing 24-48 hours after exertion. Symptoms are more severe after eccentric exercise.</td>
<td>Excessive overloading and over-reaching during training and competition.</td>
</tr>
</tbody>
</table>
rate of repair and can increase the risk of secondary hypoxic death of previously undamaged tissue, so sustained inflammation does not aid effective recovery. During this stage you will be expected to give immediate treatment and advice (using the RICE method, see Chapter 2 Sports First Aid).

The proliferative stage

This stage lasts for two–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 tissue, and are responsible for repair. Fibroblasts are the pre-cursors to collagen, elastic fibres and reticular fibres and over the coming weeks the new tissue increases in strength as the 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 ensure that the level of rehabilitation, including mobility, strengthening, flexibility, power and proprioception work which are all essential for the long-term functional rehabilitation of repairing tissue (see Chapter 6 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 ensure that the principal phase of rehabilitation, including mobility, strengthening, flexibility, power and proprioception work is all essential for the long-term functional rehabilitation of repairing tissue (see Chapter 6 Sports Rehabilitation).

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.

Figure 3.5: Client assessment form

<table>
<thead>
<tr>
<th>Subjective assessment: In your own words, how did the injury occur?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: I was playing football and was hit by the ball.</td>
</tr>
<tr>
<td>Subjective assessment: Describe your symptoms at the time of the injury.</td>
</tr>
<tr>
<td>Example: I felt a stabbing pain in my knee.</td>
</tr>
<tr>
<td>Subjective assessment: Describe your symptoms now.</td>
</tr>
<tr>
<td>Example: I still feel a dull ache in my knee when I stand for long periods.</td>
</tr>
<tr>
<td>Subjective assessment: Rate your pain (1 = not painful at all, 10 = extremely painful).</td>
</tr>
<tr>
<td>Example: I rate my pain as 5/10.</td>
</tr>
<tr>
<td>Subjective assessment: Are you taking any medication?</td>
</tr>
<tr>
<td>Example: Yes, I am taking paracetamol.</td>
</tr>
<tr>
<td>Subjective assessment: Are you currently undergoing any medical treatments?</td>
</tr>
<tr>
<td>Example: Yes, I am undergoing physiotherapy.</td>
</tr>
</tbody>
</table>

**Remember**

It is helpful for you to understand the demands of a sport when seeing a client for the first time. This will give you a greater understanding of the techniques and biomechanics associated with the sport, which will assist you in identifying factors associated with injury, and gives the client confidence in your ability.

Key term – a network of vessels that carries lymph

Lymphatic system

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

Fibroblasts – a cell in connective tissue

**Key term**

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

**Key term**

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

**Key term**

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

**Key term**

Regress – an injury getting worse

**Key term**

Progress – an injury getting better

**Key term**

Palpation – physical assessment of tissues using precise touching and feeling

**Key term**

Lymphatic system

**Key term**

Lymph

**Key term**

Fibroblasts

**Key term**

Vasodilation

**Key term**

Hypoxia

**Key term**

Proprioception

**Key term**

Regress

**Key term**

Progress

**Key term**

Palpation

**Remember**

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.

- 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?

**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.

**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 laying, 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 6 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 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?
• Any swelling? Is it soft / hard?
• 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

Supine – laying down facing up
Prone – laying face down

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. There are a number of different tests that are used by sports therapists to assess injury status including 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 to consider the 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 of movement 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.

<table>
<thead>
<tr>
<th>Joint</th>
<th>Range of Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>Flexion 45°</td>
</tr>
<tr>
<td></td>
<td>Hyperextension 45°</td>
</tr>
<tr>
<td></td>
<td>Rotation 75°</td>
</tr>
<tr>
<td></td>
<td>Lateral Flexion 50°</td>
</tr>
<tr>
<td>Shoulder</td>
<td>Flexion 170°</td>
</tr>
<tr>
<td></td>
<td>Hyperextension 50°</td>
</tr>
<tr>
<td></td>
<td>Abduction 175°</td>
</tr>
<tr>
<td></td>
<td>Adduction 160°</td>
</tr>
<tr>
<td></td>
<td>Medial Rotation 75°</td>
</tr>
<tr>
<td></td>
<td>Lateral Rotation 90°</td>
</tr>
<tr>
<td></td>
<td>Horizontal Abduction 30°</td>
</tr>
<tr>
<td></td>
<td>Horizontal Adduction 120°</td>
</tr>
<tr>
<td>Elbow</td>
<td>Flexion 145°</td>
</tr>
<tr>
<td></td>
<td>Extension 145 - 0°</td>
</tr>
<tr>
<td>Radio – Ulnar</td>
<td>Pronation 90°</td>
</tr>
<tr>
<td></td>
<td>Supination 85°</td>
</tr>
<tr>
<td>Wrist</td>
<td>Flexion 85°</td>
</tr>
<tr>
<td></td>
<td>Hyperextension 75°</td>
</tr>
<tr>
<td></td>
<td>Radial Deviation 25°</td>
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<tr>
<td></td>
<td>Ulna Deviation 30°</td>
</tr>
<tr>
<td>Hip</td>
<td>Flexion 125°</td>
</tr>
<tr>
<td></td>
<td>Hyperextension 20°</td>
</tr>
<tr>
<td></td>
<td>Abduction 45°</td>
</tr>
<tr>
<td></td>
<td>Adduction 25°</td>
</tr>
<tr>
<td></td>
<td>Medial Rotation 45°</td>
</tr>
<tr>
<td></td>
<td>Lateral Rotation 45°</td>
</tr>
<tr>
<td>Knee</td>
<td>Flexion 130°</td>
</tr>
<tr>
<td></td>
<td>Extension 130 - 0°</td>
</tr>
<tr>
<td>Ankle</td>
<td>Dorsiflexion 20°</td>
</tr>
<tr>
<td></td>
<td>Plantarflexion 45°</td>
</tr>
<tr>
<td>Foot</td>
<td>Inversion 30°</td>
</tr>
<tr>
<td></td>
<td>Eversion 25°</td>
</tr>
</tbody>
</table>

When conducting range of movement testing, compare your client’s range of movement to the established norms (allowing a few degrees either side). Table x 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.

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 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 callouses, 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.

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

0 – no contraction
1– slight contraction – poor
2– [AUTHOR TO SUPPLY]
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 that have been identified to assess the condition of the anterior cruciate ligament. Usually, ligament laxity is graded as +1 (mild), +2 (moderate) and +3 (severe).

**Check your understanding**

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

**Useful Resources**

British Journal of Sports Medicine

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**Case study**

On 14 September 2010, Antonio Valencia suffered ligament damage and a dislocated and broken ankle whilst playing for Manchester United against Rangers in the UEFA Champions League. The ankle injury has been attributed to a combination of factors including an innocuous-looking tackle by Rangers’ player Kirk Broadfoot and Valencia’s foot getting stuck in the turf after running at speed. The Scottish defender Broadfoot later stated in his interview that “I just slid in and looked round and his bone was sticking out.”

The injury is similar in nature to other injuries suffered by England Rugby international Danny Cipriani in 2008, Arsenal striker Eduardo in 2008 and Alan Smith when he was playing for Manchester United in 2006.

**Questions**

- What do you think were the mechanisms of injury in Valencia’s case?
- What were the signs and symptoms of injury?
- What will have been the body’s response to injury?
- What preventative measures (if any) could have been put in place?
- How would you tackle assessing such a serious and sensitive injury?
- What are your limitations of practice in this case?

**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.
Foundations in SPORTS THERAPY


