Sports Medicine Notes

How are Sports Injuries Classified and Managed?

Ways to Classify Sports Injuries

Classified relating to cause

- Direct / Indirect

Direct caused by external force applied to body e.g. collision. Area of contact is injured. Can result in fractures, dislocations, sprains etc.
Indirect caused by intrinsic force (within body) Normally occur; excessive movement, fault in execution, ballistic movements. Result of excessive strain on muscles, ligaments, tendons etc. e.g. muscle tear

- Soft Tissue / Hard tissue

Injuries to all except bones / teeth are soft tissue. Include skin, cartilage, tendons, ligs, muscles, blood vessels. Many types → acute (suddenly) and chronic (prolonged)
Hard tissue includes bones and teeth. Can be more serious, must be treated correctly.

- Overuse

Caused by overuse to specific area.Provoked by repetition.Can cause stress fractures that are difficult to detect.E.g.s of overuse; shin splints, tennis elbow

Soft Tissue Injuries

Tears occur; tissue is stretched excessively. Tears are strains or sprains.

- Sprains only in ligaments (bone to bone), when stretch or torn. Rehab generally reqd, will take long to heal, affect joint stability. Sprains classified – 1st to 3rd degree (3 is worst)
- Strains affect muscles/ tendons. Stretched or torn. 1st to 3rd degree
- Contusions (or bruise) caused by sudden blow to body. Internal bleeding, can continue for a long time, causes formation of haematoma as blood clots in tissue.

- Abrasions; falling on dry/hard ground. Pain, shallow bleeding, obvious symptoms. Dirt + foreign objects may enter; needs to be cleaned/removed. Treatment very crucial to sterilise
- Lacerations; irregular tear in flesh. Can be deep, and easily infected. Require cleansing, referral to doctor. Can use gauze pad + pressure to prevent bleeding. If to mouth, check no teeth dislodged, rinse with antiseptic, use ice.
- Blisters; collection of fluid within skin, can contain blood or clear fluid. Occur from new eqip, overuse, frisction. Rest reqd for approx. 24hrs. If fluid to be removed, use sterile needle, drain and apply antiseptic. If blisters open; wash area, apply antiseptic, dress. Blister block for healing process.
- Inflammatory response.

Occurs when injury occurred to soft tissue.Begins the healing process.Approx 3-4 days or longer depending on injury.

Phase one: Inflammatory (24 to 72hrs)

Increased blood flow and fluids to site of injury.Pain, redness, swelling.Loss of function, damage to area. Formation of blood vessels to promote healing (capliaries)

Phase two: Repair + Regenerative stage (3 days to 6 weeks)

Elimination of debris.Formation of new fibres.Production of scar tissue.

Phase three: Remodelling Stage (6 weeks to more)

Increased Scar tissue.Formation of new tissue to strengthen and develop.

If return too sudden, further damage can be caused. Too little exercise however, large amounts of scar tissue will form meaning a lack of strength + flexibility.

When injury sustained – immediate treatment aims are: reduce swelling, ease pain, prevent further damage.

Long term aims: Restore flex + strength, regain function, return to exercise ASAP, prevent recurrence.

Use RICER to treat. (see sheet) Also use active rest, and NO HARM (Heat, Alcohol, Running, Massage.)

Hard Tissue Injuries

- Fractures; classified into simple and compound. Simple → break but remains under skin. Compound→ protrudes through skin. Different types e.g. greenstick, depressed, impacted, oblique, traverse.
- Management:

DR ABC, control bleeding, treat for shock, immobilise area, medical attention.

- Dislocations; cause pain, obvious deformity. Real damage is to ligaments stretched →actually soft tissue with bone being displaced. Should not be put back in by victim. Treatment: immobilise, RICER, medical attention.

Subluxation; bone pops out and then back in. Still might need rehab to an extent → refer.

Assessment of Injuries

TOTAPS see sheet)

How does Sports Medicine address the demands of Specific Athletes?

Children and Young Athletes

Medical Conditions

Asthma; Characterised by breathing difficulty→reduction in width of airways→bronchi(oles). 10% Australians have it.

Signs/Symptoms; coughing, wheezing, difficulty breathing. More likely on cold days, dry air. Triggers can be; pollen, dust, stress, hair, exercise. However, exercise more beneficial than none→swimming is best option. Humid air around, strengthens lungs by pushing air out.

Directions; gradual warm-up, controlled breathing, relaxation techs. Planned medical steps in place→Puffer with spacer. Remove unwanted environmental factors (pets, carpets).

First Aid; 4x4x4. 4 puffs, wait 4 min, 4 more.

Diabetes; where body does not produce or properly use insulin. Type 1; cannot produce insulin. Type 2; inability to produce sufficient amount or use effectively. Exercise/diet considerable assistance in managing diabetes. Make sure insulin injection taken, have OJ/lollies to boost sugar levels if needed. Be aware of diabetics in group→know signs, symptoms. Diabetics require pre-game meal and hourly sugar supplements.

Epilepsy; Disruption of brain f'n causing brief, alteration to level of consciousness and results in seizures. Range of sports; individually guided by doctor. If frequent seizures; collision sports to be avoided, as well as others like rock climbing, scuba diving. Having Epilepsy →should still do sport, can use medication to treat, choose specific sports.

Others to be always present to know if seizure occurs and know how to help. Treatment; if 1st seizure; refer to doctor, 000, DRABCD. If common, let seizure pass. STOP, remove objects, help into recovery position, lightly support head.

Overuse Injuries

Stress Fractures; Local swelling/tenderness, gradual onset of pain.Treatment; immediate rest, up to 8 weeks.RICER.Ice and anti-inflammatory drugs. May need rehab (refer) When returning use corrective devices, guards, padding, strapping. (improves biomechanically) Vary activity where body part used e.g. swimming

Thermoregulation – Maintenance of stable internal temperature

Independent of temp.of environment, regulated by Hypothalamus to maintain core temp. Children are at greatest risk of environmental stress, due to inability to lose heat thru' evaporation at same rate as adults. Sweat glands not fully developed. More prone to dehydration, will acclimatise slower. Need rest/drink breaks, suitable clothing.

Appropriateness of Resistance Training

In past, not recommended to adolescents.Concerns for injury, ethics, myth of stunted growth.Doesn't stunt growth, because growth plates not affected.

Studies show→adolescents capable of improving muscle/endurance with appropriate-training regimes/principles/guides. This means; use progressive overload, not too heavy, correct technique, high reps low weight, supervision.

Put emphasis on body weight exercises; will improve health, not going to be too heavy. E.g. sit/push/chin ups.

Adult and Aged Athletes

Female Athletes

See notes already made.

What Role do preventative actions play in enhancing the wellbeing of the athlete?

Physical Preparation

◊ Pre Screening

Assesses health status before person starts program.Important for physical prep. E.g. examines age, sex, previous exp, health, problems, lifestyle.

Allows to prepare for demands associated with specific sports. E.g. resistance, interval, general conditioning, contact sports.Especially important for males 40 ^ and females 50^, asthmatics, smokers, obese, history of heart problems.

P.S; identifies risks, who must seek medical clearance to play, even supervision whilst in program. Pre –scr can be used to gain an exercise prescription using FITT principle.

◊ Skill + Technique

Efficiency with which activity performed.Correct skill essential to prevent injury.E.g tackling in football, rebounding in basketball.

◊ Physical Fitness

Ensures holds level req'd for sport (strength/cardio/power/speed). E.g. rugby →high levels Cardio, strength, speed. Gymnastics→flex, balance, strength, less Cardio.

◊ Warm-Up / Cool Down

- Sports specific. 4 phases;

General body war-up (jogging), stretching (static/dynamic), Calisthenics (push-ups), Skill Rehearsal (passing).Most important feature of injury prevention.E.g. specific→high jumper focus on stretching legs.

Cool down→prevent blood pooling, promote flex, distribute waste/acid, prevent soreness/injury.

Sports Policy and the Sports Environment

- Rules of Sports and Activities

To prevent injury e.g. well defined rules e.g. no studs up in soccer. Important→enforced by referees, governing bodies/associations. Panel/judiciary in severe cases.Fines, suspensions etc.

Some sports with noncontact still have rules to prevent injury e.g. marathon, medical facilities and water stops mandatory.

- Modified rules for Children

Smaller kids→smaller goals, times, field size, less complex rules, safety 1st. Essential for enjoyment, continual participation in game, growing/understanding of game.
Examples; soccer→rooball, AFL→auskick, cricket→Kanga cricket.

- Matching Opponents

Consider; age, weight, skill level, gender, size, maturity. Even competition is desired. Difficult to grade on all attributes. Even comps; skills matched, for closer, more enjoyable games. Emphasis away from purely winning for younger.

- Use of Protective Equipment

To prevent injury→essential. Best quality affordable. Must fit, allow movement, function, airflow. E.g. mouthguard, shin guards, headgear, boots/footwear.

- Safe Grounds, Equipment and Facilities

E.g. padding on goalposts, clearance outside field, mud/wetness, objects on field, maintained/replaced when needed, safe design. Should follow set guidelines, standards etc.

Environmental Considerations

- Temperature Regulation

Can place at risk; sun, wind, cold, heat. Must maintain core → 37'C. Controlled by hypothalamus

Heat lost thru; radiation (60%), radiated into atmosphere thru' infrared rays, evaporation (25%) heat thru' sweating, convection (12%) transfer to air, conduction (3%) from body to object.

- Climatic Conditions

Temperature; need to avoid hyperthermia and hypothermia. Vasoconstriction associated with cold →constricts. Vasodilation with heat→increase in blood vessel size.

Extremes in environmental temp(s)→requires specific strategies. Need adequate hydration→hot days can mean more water needed than is being replaced. Dehydration willocurr.

Clothing→ensure warm, protected e.g. from wind

Humidity; Impedes heat dissipation, prevents evaporation.

Vasodilation; body can lose 2-3 L per hour. Cannot replace to extent that it is lost. Thirst is a bad indicator of dehydration.

Wind; Convection/conduction contribute to wind-chill/ heat loss.Convection most prominent. Body shivers, vasoconstriction. Should→wear appropriate clothing; wetsuit, skins, warm clothes that covers areas.

Rain; Combined with wind→promotes hypothermia. Can make sports dangerous e.g. cycling, netball.

Altitude; As increases, our ability for work decreases→expect 3-3.5% every 300m above 1500m.High altitude→solar radiation stronger, reflection of rays.Sun protection essential.Affects endurance events negatively. Less resistance e.g. high jump may benefit.Adaption→V02 up.

Pollution; Can be safety hazard for people who suffer from asthma/cardio problems. Endurance events affected. Carbon monoxide most dangerous pollutant.
Avoid exercise during rush hour, smoking, in high pollution levels.

- Guidelines for Fluid Intake

Hyper hydrate before an event.200mL every 15-20 mins. Sweat plays major role in cooling→needs water to function. Reduction in water also →lowers plasma levels, blood pressure, so less blood available to muscles. Even minimal fluid loss affects performance.

- Acclimatisation

Developing tolerance to expected condition where performance needed. Applies to heat, cold, humidity, wind, altitude.5-7 days for heat/humidity, 2-3 weeks for altitude. Training in conditions causes physiological adaptions.

Taping and Bandaging

Preventative strapping for injury rehab. Increases safety, decreases chance of reoccurrence of injury

- Preventative (Prophylactic) Taping

Adhesive or non-adhesive to protect, support, restricts excessive movements, strengthens joint during movements. Use tape→low elasticity. See sheet for techniques.

Sports; agility, strength, power, explosive, frequent changes in direction, impacts, high level stress.Considerable stress on joints e.g. basketball, soccer.

High potential for injury req's preventative to minimise injury.

- Taping for Isolation of Injury

Req'd after injury sustained, needed for rehab. 3 purposes; isolates, immobilises, supports. May also be req'd when training or maintaining fitness to prevent further damage/injury.

- Bandaging for Immediate treatment of Injury

Use DRABCD. Then taping. Involves elastic bandage to for compression to control bleeding, apply pressure, support and immobilisation of injury. RICER.

How is Injury Rehabilitation Managed?

Rehabilitation Procedures

Rehab is process of restoring athlete to pre-injury level of fitness, restoring optimal function and prevent injury

1. Progressive Mobilisation

After RICER; gradually extending range of movement until fully functional.E.g. rotating a sprained ankle in figure 8s.

2. Gradual Exercises

Stretching; PNF is best as muscle→lengthened + strengthened, controlled. Heals without scarring.E.g. using elastic bands with ankle pushing against.

Conditioning; Build up in fitness as a result of adaptations to gradual increases in physical stress. Followed by exposure to game skills in a non-contact/competitive environment with ROM.Depending on nature of injury; specific programs. E.g. swimming as X-Training for a hamstring→low impact, improves cardio/muscular endurance .

Total Body Fitness; regaining mental/physical fitness. Progressive/gradual overload of muscles/energy systems to adapt before comp' engaged in.

Adaptions include; hypertrophy, strengthening of ligaments/tendons, increased capillarisation/blood flow to injured area, increased joint function, confidence in site of injury, restored balance/co-ord.

3. Training

Once total body fitness improved, full training can resume in pain-free environment.

4. Use of Heat and Cold

- Cold; 10-20 mins on/off. Ice massage-10mins, Ice Emmersion-5-10min, Vapocoolant spray to prevent muscle spasms.

Used 1st 48hrs→decrease swelling, pain, circulation to area, tissue rehab. Up to 4 days to reduce inflammation.

- Heat; used after 1st 48hrs. Reduce pain, increase flexibility + blood flow, reduce stiffness, reduce inflammation. Methods; heat packs, whirlpool baths/spas, contrast baths (heat + cold), deep heat, ultrasound.

Return to Play

Should not return until completely healed. Even then; follow specific procedures, precautions to ensure does not recur. Sometimes medical clearance needed e.g. head injuries

Indicators of Readiness to return to Play

Treatment/rehab ensure healing process has given;

Elasticity (new tissue flexible), Strength (new tissue strong + able to support), Mobility (agility + ROM), Pain Free, Balance (balance whole body weight on injured limb)→all to be successful in stress/game sit's.

Monitoring Progress

Results from pre-test (before injury) compared to post-test (after healed); this can show where gains lost e.g. speed, power. To incorporate specific movements e.g. agility test for knee, throw for arm.

Psychological Readiness

Need confidence, positive outlook. Difficult to judge this area, some may want to play before recovered→eager, pressure, impatient. These can invite re-injury. Need balance between motivation, confidence, common sense. Tests (above) can show when ready giving positive assurance.

Specific Warm-Up Procedures

Ensure fully warmed up, stretched. When returning from injury; specific warm up→e.g. additional stretching, PNF, for sprinter whose hamstring torn previously. To be extended in safe environment further than demanded in competition.

Progressive Involvement

Come back gradually, e.g. 20min of 45 a half, build up game time. Play lesser position/lower grade.

Return to play Policies and Procedures

In many amateur comps, individuals make decision, with consultation from doctor, trainer, physio, coach. At professional level; policies exist. A re-injury can be very detrimental to indiv/team.

Protocol may involve; consultation, X-rays, discussion, fitness assessments + results. Even then, coaches/trainers can use own criteria, but varies with sports. E.g. NFL→mandatory 1 week off if concussion occurred, no policy for league.

Ethical Procedures

Pressure to play from various sources. Some high up take pain killers + heavy strapping to play even if not fully recovered. Players possibly seen as commodities→being paid, must live up to value.

Painkillers popular→injected ones of concern. Pain tells us of damage, need to rest. Pain-killing injections can mean more damage unknowingly done, prolonging healing process. Permanent damage/mutilation of fibres may occur.

Pain can be bad; affect movement efficiency, take away focus, mean likely for more/other injury, or bad performance. Choices/decisions might be made by doctor/coach, but ultimately player has choice. However, not always easy or powerful→threats to be kicked off team, out of favour.

PDHPE – Sports Medicine

Sports Medicine

Ways to Classify Sports Injuries

- Sports or performance injuries can be classified according to either the cause of the injury or the type of body tissue damaged
- If injuries are classified according to *cause,* the three categories are direct injury, indirect injury and overuse injury
- If injuries are classified according to the *type of body tissue* damaged, the two categories are soft-tissue injury and hard-tissue injury

Classification According to Cause

Direct Injury

- A direct injury is caused by an external blow or force. Direct injuries can be caused by:
  - A collision with another person (for example, during a tackle in rugby union)
  - Being struck with an object (for example, a cricket ball or hock stick)
- Examples of injuries that result from external forces include haematomas ('corks') and bruises, joint and ligament damage, dislocations and bone fractures

Indirect Injuries

- An indirect injury can occur in two different ways:
  - The actual injury can occur some distance from the impact site (for example, falling on an outstretched hang can result in a dislocated shoulder)
  - The injury does not result from physical contact with an object or person but from internal forces build up by the actions of the performer, such as may be cause by over-stretching, poor technique, fatigue and lack of fitness. Ligament sprains and muscle strains and tears are examples of these injuries

Overuse Injuries

- Overuse injuries occur when excessive ad repetitive force is place don bones and other connective tissues of the body
- Light or no pain may be experience in the early stages of these injuries and the athlete might continue to place pressure on the injured site. This prevents the site being given the necessary time to heal.
- Eventually damage accumulates, and the injured site becomes inflamed and therefore painful.

- The symptoms of overuse injury occur when there is a change in training practises (such as increased training frequency or intensity) and the body is unable to deal with the new stresses that are placed upon it.
- Large number of overuse injuries result from poorly planned training programs with no appropriate given rest periods
- Poor technique and use of equipment also cause overuse injuries because athletes will begin to practice with incorrect technique and equipment placing extra stress on the body
- *Examples include* repetitive forces that cause stress fractures (small crack on the bone) and tendonitis (inflammation of a tendon)

Classification According to Tissue Type

Soft-Tissue Injury

Most common type of injuries resulting from participation in sports. They include the following:

- *Skin injuries* – abrasions, lacerations and blisters
- *Muscle injuries* – tears or sprains of muscle fibres and contusions
- *Tendon injuries* – tears or sprains of tendon fibres and inflammation (tendonitis)
- *Ligament injuries* – sprains and tears of ligament fibres

There are three types of soft tissue injury: *acute injuries, overuse injuries and chronic injuries*

- Acute injuries – these injuries occur suddenly from a known or unknown incident. An example is *a fracture*
- Overuse injuries – overuse injuries occur to soft tissues due to repeated actions over a period of time. They take a number or weeks or months to develop. An example is *shin splints*
- Chronic injuries – chronic soft injuries are those that continue to be a problem for an extended period of time (six months or longer). It may be due to the fact that rehabilitation was not complete and there continues to be a weakness in the area. An example is *Achilles tendonitis*

Examples of Soft-Tissue Injuries

Tear	-A tear is a disruption of the fibres of a muscle or tendon. -This can be tiny or microscopic (often called a strain). -A tear can be more severe, and involve larger fibres of muscles and tendons. -Tears and strains occur when a muscle or tendon is over-stretched or when a muscle contracts too quickly
Sprain	-A sprain is a tear of ligament fibres, muscle or tendons supporting a joint. -This can occur when a joint is extended beyond its normal range of movement -A sprain can involve a small number of fibres through to a complete rupture
Contusion	-A contusion or bruise is bleeding into the soft tissue -It is caused by a direct blow from another person, an implement or an object -A bruise can occur to any soft tissue of the body
Skin abrasions	-Occurs when a player scrapes their skin across rough ground of the rough surface of another object – the skin is grazed and broken, but there is no deep tear. -Dirt or gravel may be contained in the open wound, and

	should be removed immediately.
Lacerations	-When the skin is lacerated (cut), the depth and location of the laceration is deep enough to expose tissues, such as fat, tendons or bone
Blisters	-Blisters result from friction (rubbing) -One layer of skin separates from another and a small pocket of fluids forms. -Blisters can be caused by equipment, shoes, pressure from callus build-up, increased training loads or simply by the recommencement of training after an extended rest period

Inflammatory Response

- The initial repair of body tissue is the *acute inflammatory phase.* It exists during the first 24 to 72 hours after injury.
- The immediate response of the body to injury is to increase the flow of blood and other fluids to the injured site.
- If blood vessels at the site are damaged there will also be direct bleeding into the surrounding tissue
- The accumulation of fluid in the area causes an increase in tissue pressure, which produces pain
- All these changes produce what we call inflammation; this consists of redness, heat, swelling, pain and loss of function.
- If inflammation is left unchecked and persists for a long time, formation of scar tissue will be more severe.
- The extent to which the formation of inflexible scar tissue can be prevented will, in part, determine the time required for rehabilitation of the injury and the degree to which normal functioning can be returned to pre-injury level

Sports Injury Flow Chart

Injury Occurs

1. DRABC – first step taken for ALL injuries
2. STOP – fast, on field assessment
3. TOTAPS – thorough assessment
4. Then depending on the injury sustained
    a. RICER
    b. Skin Injury Management
    c. Fracture Management
    d. Dislocation Management

Management of Soft Tissue Injuries

RICER

- The management of soft tissue injuries is largely concerned with decreasing the amount of tissue damage, keeping the rehabilitation period as short as possible and enabling the athlete to make a complete recovery so that they can return to play.
- RICER is the most important aspect of soft tissue injury management: Rest, ice, compression, elevation, referral

RICER	*How*	*Why*	*Time*
R	To reduce bleeding into the injury and prevent further injury	Place in comfortable position with the injury and supported	Until beginning a program of careful mobilisation
I	To reduce: -Pain -Blood flow -Swelling -Spasm -Enzyme activity -Tissue demand for oxygen	-Crushed ice in a wet towel and wrapped around the injury, or -Frozen gel packs using a towel as an insulator (as frozen is colder than ice), or immersion in a bucket of iced water (note: insulating material, such as towels, prevents possible tissue damager from overexposure to cold)	20 mins every hour up to 4 days
C	-Decreases bleeding -Reduces swelling	Wrap an elastic bandage over the injured area, covering both above and below the site	At the time of the injury and reapplied periodically for at least 24 hours
E	-Decreases bleeding -Reduces swelling -Reduces throbbing	Raise the injured area above the level of the heart by placing a support eg. pillow under the injury	Whenever possible during the day and for the following two or three nights
R	-To understand the nature and extent of the injury -To seek guidance in a program or rehabilitation	Appointment with a doctor or physiotherapist	As soon as possible following the injury

Hard Tissue Injuries

- Involving damages to the bones of the skeleton
- Ranging from severe fractures and joint dislocations to bruising of the bone
- A direct force can bruise a bone and cause bleeding between the outer layer of the bone ad the underlying compact bone.

Fractures

- A fracture is a break in a bone. This can result from a direct force, an indirect force or repetitive small impacts (as occurs in a stress fracture)
- If the skin over a fracture bone is intact, the fracture is described as 'simple' or 'closed'
- Of the skin over a fracture is open, the fracture is described as 'open' or 'compound'
- The skin might be broken either by the force of the injury that caused the fracture or by a piece of broken bone protruding through the skin
- A fracture is described as 'complicated' if nearby tissues and/or organs are damaged
- Signs and symptoms of a fracture include:
    - Pain at the site of injury
    - Inability to move the injured part
    - Unnatural movement of the injured part
    - Deformity of the injured part
    - Swelling and discolouration
    - Grating of bones

Dislocations

- Dislocations are injuries to joints where on bone is displaced from another
- A dislocation is often accompanied by considerable damage to the surrounding connective tissue
- Dislocations occur as a result of the joint being pushed past its normal range of movement
- Common sites where dislocations occur are the finger, shoulder, elbow and knee
- Signs and symptoms of dislocation include:
    - Loss of movement at the joint
    - Obvious deformity
    - Swelling and tenderness
    - Pain at the injured site

Managing Hard-Tissue injuries

Medical Treatment

- Hard tissue injuries can be accompanied by significant damage to muscle, blood vessels, surrounding organs and nerves
- Immediate medical assistance is required
- For serious hard-tissue injuries, the person should not be moved, and an ambulance should be called
- Immediate management in this situation is as follows:
    - Immobilise and support the injured site with a splint or sling
    - Check for impaired circulation and other possible complications
    - Arrange for transport to hospital and professional medical assistance
    - Implement the RICER procedure – of it does not cause pain

Immobilisation

- Management of hard-tissue injuries aims to minimise movement of the injured area
- This is achieved by immobilising the joints above and below the injury site
- If the injury site is the shaft of a long bone (eg. the humours, femur) the injury can be supported with a sling or splint
- A splint can be either another limb or another part of the body or a firm, straight object.
- The correct application of the splint is essential. When correctly applied, a splint is secured at all these points:
    - Above the joint above the fracture
    - Below the joint below the fracture
    - At the joint above the fracture
    - At the joint below the fracture
    - Just above the fracture
    - Just below the fracture

TOTAPS

- This ordered procedure will provide information about the extent of the injury, and will indicate whether the person should be permitted to continue the game/performance or should be given professional medical help. TOTAPS stands for:
    - T for Talk
    - O for Observe
    - T for Touch
    - A for Active movement
    - P for Passive movement
    - S for Skills test
- Bleeding takes priority over TOTAPS

Talk	-Ask the athlete questions to gather information about the cause, nature and site of the injury. eg. How did the injury happen? -For suspected concussion the questions should be directed at discovering the athlete's alertness and level of consciousness -The first aider can also seek information on the history of the athlete. eg. previous injuries to the body part -Talking to a witnesses who may have seen the injury occur
Observe	-Visually examine the sire of the injury -Look for deformity, swelling and redness -If the injury is to the limb, compare it with the corresponding area on the opposite limb -If there is obvious deformity, there is likely to be a fracture or serious ligament/tendon damage, medical assistance is needed. -If there is no deformity move on to the next stage of the assessment ('touch')
Touch	-If there is no obvious deformity and the athlete is not especially distressed, feel the site of the injury. -Using your hands and fingers gently touch the site without moving it -If possible, feel the corresponding site on the other side of the body and compare the two sides -Note any differences in bone shape and skin temperature -Observe the level of distress as you touch the injury. if touching the injury causes the athlete intense pain, the injury might be serious. But, if touching the injury causes slight pain move onto the next stage of the assessment ('active movement')
Active Movement	-Ask the athlete to attempt to move the injured part -Observe the degree of pain, also observe the extent or range of movement that is achieved by the athlete. -As the athlete moves, feel the injured site for any clicking or grating -If the athlete cannot move the injured site, or has minimal range of movement the RICER procedure is used, and medial assistance is needed -If the athlete can move without intense discomfort then proceed to the next stage ('passive movement')
Passive Movement	-If you have reached this stage, the injury is likely to not be serious -A decision needs to be made as to whether to athlete should continue to play -Requires the first aider to move the athlete's injured body part and determine how much pain-free movement is possible -If the athlete cannot have the injured part manipulated through the normal range of movement without pain, the first aider should not continue -If range of movement is normal, the athlete should be asked to stand

Skills Test	-If the athlete can stand, have the person place pressure on the injured site by performing movements similar to those required in the activity to be resumed -For example, the athlete could run, hop, jump and push -If these actions can be completed the athlete may resume the activity -Ask the player to perform the fundamental skills necessary to resume play

Children and Young Athletes

Medical Conditions

- Children with certain medical conditions should avoid contact sports
- Medical conditions can prevent participation in sport altogether
- Conditions such as asthma, diabetes and epilepsy may affect the athletic performance of any person
- Children are not necessarily more likely to accumulate these problems, but any athlete who suffers from these conditions should take certain precautions when participating in sport
- Children with these health issues must inform their coaches or carers of their condition, to ensure that if complications do develop, correct responses are used.
- Intense activity appears to be one of the most important factors in causing problems for all three conditions

Asthma

- Asthma is the narrowing of the airways that makes breathing difficult
- Strenuous physical activity can trigger an asthma attack in some sufferers
- This is called 'exercise-induced asthma' and is very common among asthmatics, it can occur either at the stat or during activity but it is most common at the end of exercise. Symptoms include
  - Coughing
  - Shortness of breath
  - Wheezing
  - Tight chest
- On exposure to certain triggers, the airways narrow making it difficult to breathe
- Common triggers include
  - Temperature changes
  - Cigarette smoke
  - Dusts and pollens
  - Animal hair
  - Certain medications
  - Colds and flu
  - Exercise
- Children with asthma are encouraged to swim because the fitness gained through swimming encourages deep breathing, and also facilitates air to be breathed in just above the waters surface, which is already warmed and humidified. Minimising the risk of an asthma attack
- When care is taken, asthma is not a serious barrier to participation. Although, these points should be noted when training asthmatics
  - Ensure the person has an adequate warm-up
  - Don't ask the person to perform if they have had an asthma attack recently
  - Provide opportunity for rest

- Have the person use preventative medication, if necessary, and ensure it is with the person at all times
- Take extra care in cold or dry weather, or if the person is suffering from a respiratory infection
- Know the athlete's limits
- Be aware of asthma management techniques and be familiar with the individual person's asthma management plan

- A puffer is kept on the athlete during physical exercise and when an asthma attack occurs
- Plan of management for an asthma attack:
    1. Give four puffs of the inhaler
        a. Only resume exercise if all symptoms have disappeared
    2. Wait 4 minutes, if no improvement another 4 puffs
    3. If little or no improvement call an ambulance

Diabetes

- Diabetes is a chronic metabolic disease, marked by high levels of glucose in the blood
- Type 1 diabetes is most common in children and you people, and it occurs when the body is unable to produce insulin
- It can be controlled with a proper regimen of
    - Diet
    - Medication
    - Exercise
- Diabetes can have a large impact on participation in sport, as the body uses glucose as a fuel source ad if the body is unable to produce enough stores of glucose it will make the athlete weaker and un-well.
- Coaches must be aware of the condition and alter training sessions accordingly
- Participants with diabetes need to be aware of how to deal with their condition and the appropriate adjustments and responses that could be made
- Diabetic athletes should prepare themselves for the demands of training or participating by adhering to specific dietary requirements and by monitoring their blood glucose level
- Hypoglycaemic episodes occur when blood glucose levels fall below their normal range. Symptoms include:
    - Increased heart rate
    - Sweating
    - Shaking
    - Anxiety and confusion
    - Dizziness
    - Possible altered state of consciousness
- To treat such episodes provide the athlete with fast-acting carbs eg. lollies, musli bars, fruit, cordial
- Hyperglycaemic episodes occur when blood glucose levels are elevated above their normal range. Symptoms include:
    - Thirst
    - Vomiting
    - Excessive urination
    - Rapid breathing
    - Rapid, but weak pulse
    - Drowsiness
- If a diabetic collapses during exercise, glucose should be given immediately, medical attention should be sought and the patient should be kept calm and warm. If

unconscious, place them in the recovery position call for medical help and continue DRABC until help arrives

Epilepsy

- When normal electrochemical activity in the brain is disturbed, a seizure (sometimes known as a fit) occurs
- Epilepsy is a condition characterised by seizures that make individuals unable to control their movements
- A less severe form of the illness can cause people to have temporary loss of awareness without a fill seizure, some cases of epilepsy are due to small areas of damage ('scars') in the brain but, in most cases, the exact cause is unknown
- Children and young people with epilepsy can participate in physical activity as modern medication available is able to reduce the likelihood of seizures
- When participating in in physical activity it is important to know what fatigue and extremes of body temperature can trigger an epileptic seizure
- If a young child/athlete has a seizure the following steps should be taken
    - Do not try and restrain the person
    - Let the seizure occur but move away any objects that may harm them
    - Once finished – place in the lateral position
    - Loosen any tight clothing
    - Reassure the person
    - If the seizure lasts longer than 5 minutes call the ambulance
- All circumstances of the individual should be assessed and guided by a doctor
- If the seizures occur on a daily or weekly basis, collision sports should be avoided
- Sports including swimming alone, scuba diving and rock climbing must be completely avoided, as a seizure may go unnoticed or cause loss of control, leaving to serious injury or death

Overuse Injuries

- Repeated use of a part of the body, causing tissue damage and discomfort
- It means that the injury has not had time to heal properly
- Most common for young people:
    - Stress fractures
    - Tennis elbow
    - Achilles tendonitis
    - Swimmers shoulder
    - Runners knees
    - Growing pains – knees, ankles
- *Stress fractures* are caused by repeated trauma to a bone that leads to small fractures in the bone, common for children in the elbow, tibia and back
- Most common causes of overuse injuries:
    - High training volume and intensity
    - High training frequency
    - Inadequate warm-ups
    - Lack of a good, general level of fitness
    - Biomechanical problems leading to stress on particular parts of the body
    - Unsuitable equipment, such as running shoes that don't provide proper support
    - Strength and flexibility imbalance leading to poor body alignment
- To help avoid the risk of overuse injuries it is suggested that children have days of non-training and monitor the volume and intensity of their exercise
- Children are susceptible to overuse injury because of different growth rates in bone and soft tissue

- When repetitive stress it placed on a body part (bone, tendon or muscle) without enough recovery time for the body part to heal and repair this causes overuse injuries and stress fractures, as the body does not have adequate resting phases to heal the body and the injury.
    - This happens especially when you specialise in one sport when a certain action is repeated
- Plenty of rest and recovery is necessary to help prevent overuse injuries, allowing athletes to participate in a variety of sports – allowing different muscles to be used for reducing repetitive strains on body parts
- To avoid overuse injuries, coaches and athletes should consider:
    - Including cross-training activities to ensure the same muscles are not continually worked and therefore have time to recover
    - Buying correct equipment to ensure suitable cushioning, such as correct running shoes
    - Selecting appropriate sports and drills that fall within a young athlete's ability level
    - Using appropriate warm up and cool down procedures
    - Ensuring adequate rest time between training sessions

Thermoregulation

- Controls temperature through balancing heat loss with heat gained
- Children are at an increased risk from environmental stress when compared to adults
- Children loose heat through evaporation at the same rate as adults, therefore relying them on radiation and convection to loose heat
- Shorter tolerance in extreme heat, putting them at a greater risk on hot, humid days due to slower acclimatisation to heat
- Children have a higher chance of developing hypothermia from exposure to cold when compared to adults placing them at a greater risk in these environments
- Children compare with adults have:
    - Smaller limbs in relation to torso size
    - Less-developed sweat glands
    - Less muscular development
    - Larger skin surface area
    - Less fluid in their bodies and more opportunity to lose small amount of fluid through their larger skin surface area
    - More likely to lose fluid and dehydrate
- Sweating is an important as it is a source of cooling the body, children are more likely to become overheated and suffer heat stress as they don't have developed sweat glands to release sweat and fluid out of the body
- Due to smaller muscular development, than adults they are less able to generate heat through muscular activity
- Children shouldn't exercise for long periods of time (more than 30 minutes) in any extremes of weather conditions, including hot or cold and should be encouraged to drink small amounts of water frequently to replace any fluids lost and wear appropriate clothing

Appropriateness of Resistance Training

- Creates an improvement in:
    - Strength
    - Motor performance
    - Injury protection
    - Self-esteem
    - Body image
    - General health (reduced risk of CVD and diabetes)

- Combined with aerobic training can enhance a young athletes sporting performance
- This type of training is both safe and beneficial, for both physical and emotional wellbeing
- Use own body weight for resistance training – overtime can progress to use weights
- Resistance programs always need to be designed specifically to each athlete to ensure no risk of injury, specific to the sport and relevant to the overall training program

Adult and Aged Athletes

- Important considerations must be given specifically to this age group, and medical conditions need to be taken into consideration
- Medical conditions including:
  - Coronary heart disease
  - High blood pressure
  - Cancers
  - Mental disorders
  - Osteoarthritis (deterioration of joints)
  - Osteoporosis (brittle bones)
  - Vision and hearing problems
- Medial conditions can reduce physical activity, and a reduction in physical activity complicates the normal process of ageing
- As a result of ageing the ability to function efficiently decreases, due to disease, illness, medical conditions or 'wear and tear' on the body
- Exercise programs aimed at aerobic capacity, flexibility and coordination can improve the ability to function efficiently
- Improves quality of life and independence, and increases aerobic endurance, strength, energy levels, balance and coordination and flexibility to assist in weight maintenance
- Side-benefits including self-esteem, independence, sleep patters, social interaction and enjoyment are also vital for physical and emotional improvements when ageing

Heart Conditions

- As we age, the cardiovascular system becomes less efficient and leads to a decreased ability to carry oxygen
- Problems associated with this process can include a weaker heart, narrowed and less elastic blood vessels and high blood pressure. The lungs are also less elastic, with makes it harder to breath
- Participants in aerobic events are therefore the most affected by heart problems, older athletes should avoid such strenuous exercise and not reach over 60-75% of their maximum heart rates
- Older athletes become fatigued easier and take longer to recover
- Adequate time and consideration must be given when coaching
- A wide variety of physical activities are suitable, as they do not place excessive stress on the cardiovascular system, eg. walking, cycling, golf and lawn bowls
- Hypertension is high blood pressure, evidence shows that physical activity is beneficial for those suffering hypertension as it makes them less likely to suffer from a heart attack when being physical activity
- Coronary artery disease is the narrowing and hardening of the arteries due to atherosclerosis and arteriosclerosis. Physical activity is beneficial to heart attack patients with this disease as it increases the amount of oxygen delivered to cells throughout the body.

- Intensity of exercises needs to be monitored closely and should maintain a low intensity during sessions and when returning back to exercises, gradual increases can be made once adaption has occurred
- Adequate rest breaks and periods are necessary to avoid strains on the body overtime

Fractures and Bone Density

- Most important objective of sports participation programs for people who have osteoporosis is to reduce the risk of falls and subsequent fractures
- Physical activity increases bone mass and makes bones stronger
- Older women – exercise delays post-menopausal bone density loss
- Inactivity should be avoided as it encourages calcium discharge from bones, making them weaker
- Sport should be safe, beneficial and not cause pain
- Focus should be placed on improved physical fitness – balance, strength, coordination, aerobic capacity and flexibility
- Types of exercise and sports options available include:
    - Endurance activities such as walking, cycling, swimming
    - Low impact and balance activities such as aerobics
    - Low range of strengthening exercises focusing on limbs, trunk and back
- High loads must be avoided and resistance developed gradual through individual strength eg. avoid using weights
- Develop postural retraining
- Research suggests that physical activity for older people increases:
    - Muscle capacity
    - Stamina
    - Balance
    - Joint mobility
    - Flexibility
    - Agility
    - Overall physical coordination
- Regular, vigorous exercise decreases the risk of CVD
- Older people often experience – arthritis, aching joints and tight muscles
- Positive responses to exercise programs that increase balance and stability and that focus on state stretching and improving a range of motion in joints aiming to reduce fractures caused by falls
- Programs need to:
    - Low impact
    - Be specific to a person's physical limitations
    - Consider existing medical conditions that might limit movement

Flexibility/Joint Mobility

- As people age, their musculoskeletal system deteriorates, reducing mobility
- Exercise and physical activity prevents joints from seizing up and maintain good flexibility for daily functioning
- Reduced mobility can restrict participation in physical activity
- Keeping active and mobile will increase quality of life and reduce injuries
- Flexibility exercises for people who are mobile could include:
    - Yoga
    - Pilates
    - Stretching
    - Dance
- Flexibility exercises that can be performed from a sitting down position include:

- Shoulder rolls
- Hamstring stretch
- Heels up/toes up
- Front leg
- Ankle stretch

- Building up balance and coordination through workouts will reduce the risk of falls in day to day life
- It is important for older athletes to maintain flexibility to assist with being mobile

Female Athletes

Participation in sport can achieve for women the same physiological, psychological and social benefits as for men. Much research overtime has focused on determining the health risks associated with females competing in intensive and strenuous activities and training

Eating Disorders

- Female athletes involved in sports that require low body fat levels are at greater risk of developing eating disorders
- Factors including weight control, food intake and physical activity are all linked to an athletes weight and problems associated
- Eating disorders are more common in women, because many female athletes are very concerned about their food intake and weight control.
- The incidence of eating disorders such as anorexia nervosa and bulimia have increased remarkably overtime
- High-level physical activity can be a risk factor for eating disorders only if other predisposing factors are evident, eg. poor self-esteem
- Extreme exercise becomes a symptom of eating disorders, with exercise being undertaken to burn off fat and no other purpose
- For some women, extreme exercise is a way of dealing with conscious or unconscious emotional conflicts.
- Disordered eating leads to starvation and dehydration, both of which impair performance
- Awareness and signs and symptoms by outsiders are essential and a multidisciplinary approach is necessary to treat the condition
- Sports such as ballet, gymnastics, diving, ice skating and body building as well as endurance sports including long distance swimming, running and triathlon focus on 'appearance' and anorexia nervosa is common among elite female athletes in these fields of sport
- Starving to achieve the 'ideal' body shape has lead to an increase in the number of eating disorders among female athletes

Iron Deficiency

- Iron is an important nutrient for the body and for good health
- The amount of iron needed is dependant on an individuals age, gender and activity level
- Females need twice as much iron as males, this difference is mainly due to blood loss during menstruation, as iron is a major constituent of blood
- A lack of iron (iron deficiency) is common in females, including athletes. Iron is needed in the blood to carry oxygen and carbon dioxide and in important muscular and energy production chemical reactions
- Symptoms of low iron include lethargy, weakness and fatigue
- Iron deficiency can result in anaemia (low blood count)

- Leads to reduced rate of lactate clearance, which is the removal of waste product in lactic acid within the muscles
- The slower the lactate clearance rate, the early fatigue is caused
- It is important, when iron deficient for female athletes to maintain a correct intake of vitamins and minerals to replace the loss of iron within the body
- Vegetarians also must be careful of adapting an iron deficiency and replace the loss of iron due to no red meat within the diet with iron tablets and other minerals
- Good sources of iron include:
    - Meat, seafood and poultry
    - Legumes and nuts
    - Whole grains and cereals
    - Dark green, leafy vegetables
    - Eggs
- Iron absorption is best achieved from foods that contain haem iron, red meat and meat alternatives are the best sources of haem iron
- Iron absorption is improved when a source of vitamin C is consumed with the meal containing and iron source

Bone Density

- Bone density refers to the thickness and strength of bones
- Calcium deficiency is associated with osteoporosis and bone fractures in older females
- Calcium is necessary for bone strength and is also required in the blood to allow muscles and nerves to function correctly
- Causes of calcium deficiency in bones include hormonal changes associated with menopause (cessation of menstrual period), decreased exercise and inadequate amounts of calcium in the diet
- Athletes with amenorrhea (cessation of menstruation when of reproductive age) are also prone to calcium deficiency because of decreased calcium intake or lower oestrogen levels, or both.
- Good sources of calcium include:
    - Milk
    - Cheese
    - Yoghurt
    - Fruit and vegetables (especially green leafy varieties)
    - Fish with bones (such as sardines)
- Adequate calcium intake is essential for maintain bone density
- Athletes need to be mindful of maintaining adequate calcium levels so as not to affect bone density, which may lead to increased risk of injury
- Regular exercise – of a light to moderate intensity, is recommended in younger females as a means of decreasing the risk of osteoporosis in later life
- Oestrogen is also very effective in maintaining bone density, more affective than increased dietary calcium in this regard
- Low bone density is associated with amenorrhoea

Pregnancy

- Mild to moderate exercise is safe and beneficial for pregnant women
- Many elite athletes have trained and performed at various stages throughout and after pregnancy without no apparent problems
- Some woman have performed better postpartum (after giving birth)
- Exercise is contradicted (that is, considered dangerous) in high-risk pregnancies. eg. women who have experienced a miscarriage, a multiple pregnancy, premature labour or high blood pressure
- Basic training guidelines:

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

Physical Preparation is essential to enhance the well-being of the athlete. It involves ensuring the body is ready for the movement or activity the body is about to undertake. It plays a large role in the prevention of sports related injuries through the basis of:
It involves:
-Conducting pre-screening (or pre-exercise screening) to determine a starting point for exercise
-Promoting the particular skills and techniques required
-Developing physical fitness, with an emphasis on those fitness components that are specific to the individual athlete's performance
-Following adequate warm-up, stretching and cool-down procedures.

Pre-screening
-Starting point for athletes, based on their history regarding fitness and the certain sport
-Prior to the conduction of aerobic training sessions
-Determines an athlete's current fitness level and goals they wish to achieve within the sport, in regards to fitness and their future within the sport.
-Become familiar to the athletes medical history
-Information is received through a questionnaire
-It allows exercise programs to be tailored specifically to the sport and the individual needs of the athlete
-Factors included in a pre-screening questionnaire include: age, sex, medical history, lifestyle factors, injuries, motivation, goals, facilities available, time available, previous experience, pregnancy etc
-Strengths and weaknesses of the athlete can be identified
-Used as a motivational tool, which is used to measure improvement

Skill and Technique
-Injuries resulting from poor skill or technique
-Injuries can be a result of a single direct blow (eg poor head position when making a tackle in rugby league) or repetitive minor impacts.
-A contact sport like rugby league are ones that have direct blows to the body
-Coaches must place extra responsibility in the preparation stages and learning stages of skills to minimize injuries and maximize correct technique
Correct skill and technique can prevent injury in all sports, but this is especially so in:
-Rugby, Australian football and boxing—Those with the correct skill and technique are less likely to be injured in these contact sports.

-Cricket—The batter with correct technique is less likely to be struck by the ball
-Volleyball—The well skilled are at less risk of hand and finger injuries.
-Hockey—The well skilled are less likely to be hit by an opponent's stick.
-Certain environmental factors can cause and lead to further injuries. Therefore certain conditions and situations have been modified for safety reasons. Eg) In rugby union, the referee promotes scrum safety by controlling the engagement of the front row through the use of the crouch–pause–engage command.

Physical Fitness
-Physical components of fitness apply. Eg flexibility, endurance, strength etc
-Athletes can prevent injuries by placing special emphasis on developing the physical components specific to their activities.
-Specific needs for athletes regarding fitness vary from sport to sport, and then within a sport varying from position to position
-Emphasis on special requirements in sport can reduce injuries, improve specific physical fitness and core strength. Eg in rugby union, forwards would need to undertake a specific neck-strengthening program as they are prone to injury from scrums.
-Individuals need specific physical preparation for various reasons including:
- Previous Injury
- A medical condition
- A disability
- An identified personal playing weakness

Warm-up, Stretching and Cool-Down
-During any training/fitness session it is desirable to begin with a warm-up and end with a cool-down

Warm up prepares mentally and physically, increases blood flow to muscles and improves flexibility
-Prepares and fine-tunes the body for physical training or competition
-Must focus on the muscle and movements specific to the activity, although other areas of the body that may not seem specific to the sport should not be ignored.
-Should last between 20 and 35 minutes, but it can be shortened or lengthened depending on climatic conditions. Eg. Rain or extreme sunlight
-The purpose of a warm up is too:
- Increase blood flow and oxygen to the active muscles
- Increase body and muscle temperature
- Stretch ligaments and muscles to permit greater flexibility and reduce chances of injuries
- Assist mental preparation
- Allow the athletes to commence the activity at their physical and mental peaks

-A warm-up should be structured into there main sections: easy exercise, stretching and vigorous exercise

Stretching prepares muscles for movement, reduces the likelihood of strains and tears
-A stretching routine should last for 10-15.
-A correct stretching exercise will:
- Increase the length of muscle
- Reduce tension in the muscles
- Increase blood circulation
- Increase blood circulation
- Improve range of motion at the joint

-Reduce the chances of new injury occurring or an old injury re-occurring
-There are two types of recommended stretching exercises – static stretching and PNF (proprioceptive neuromuscular facilitation) stretching.

-The following guidelines should be followed when stretching:
- Relax and stretch slowly
- Breathe normally
- Do not push a stretch to an uncomfortable position
- Do not engage in ballistic stretching, which involves bouncing or stretching with jerky movements
- Place special emphasis on the major muscle groups used in the activity and any muscles previously injured

Cool down allows recovering successfully before next session, prevents blood pooling in limbs, helps remove lactic acid, maintain flexibility and decreases muscle sources
-Assist the body to adjust from the intense activity back to a normal pre-exercise state
-Reduce muscle soreness and tightness and will allow the athlete to recover more quickly
-Begins with intense activity then is gradually reduced
-Extra emphasis is needed on the major muscle groups used, and on those previously injured

- *Sports policy and the sports environment: rules of spots and activities, modified rules for children, matching or opponents, use of protective equipment, safe grounds, equipment sad facilities*

Rules of Sports and Activities – foster safe participation.
There are consequences for not playing by the rules eg. Not lifting a player above the horizontal in rugby decreases the risk of spinal injury.
-In rugby league, rules governing tackling outlaw dangerous tackles, such as head high or spear tackles. Players will be penalized for committing these offences with either a yellow card and the sin bin or the red card and a send off.
-Responsibility is placed on the officials and coaches to ensure that the players under their control and care participate in the right spirit and do not intentionally infringe the rules.

Modified Rules for Children
By decreasing the size of equipment and field, making the rules simpler, equipment softer and games shorter, children can gain a lot more satisfaction from sport.
Example: t-ball, minkey hockey, kanga cricket.
-Lowers the risk of injury
-In relation to some sports, game modification has involved the design of a complete new game to develop the basic skills of the original game
-For example, Walla Rugby – no pushing in scrums and no lifting in line outs etc

Matching of Opponents
Refers to growth and development as well as skill level. Grading of competition leads to safer participation. Grading is done by both age and skill level.

Use of Protective Equipment – reduces injuries
Protective gear needs to be correctly fitted, the correct size for the athlete and in good condition.
The basic purpose of protective equipment is:
- To absorb and disperse energy from a direct blow (Eg mouth guards and helmets)
- To deflect a blow and protect against sharp instruments (Eg chest guard in fencing
- To limit excess movement (Eg studs in football boots and joint harnesses/braces)

-Some types of common protective equipment include: helmets, mouth guards, harnesses/braces, shoulder pads, shin pads, and correct footwear
-Protective equipment should be relevant to the sport

Safe Grounds, Equipment and Facilities
Fields and courts need to be on flat, level surfaces that are not slippery, free from obstructions and any posts should have padding and shade if possible. Equipment needs to be maintained and correctly fitted.
-Safe design and positioning of fields and courts reduces the risk of injury and harm to participants
-Courts and fields should be:
- Positioned far enough apart to prevent games or players clashing
- Positioned away from dangers, such as roads, rivers, dams, cliffs, trees, fences, walls and buildings
- Designed in a north-south direction to prevent the vision of players impeded by the sun
- Fitted with adding when necessary (Eg on goal posts)
- Constructed on even ground and not have head or rough surfaces (especially if contact with the ground is likely)

-All equipment must undergo safety checks
-Equipment should be size appropriate to the athlete
-Any danger must be immediately taken care of and removed
-Coaches and umpires must be alert at all times, and take care of any dangers or hazards to the game and the athletes
-Dangers can be evident due to weather and environmental conditions, these must also be monitored

- *Environmental considerations: temperature regulation, climatic conditions, guidelines for fluid intake, acclimatisation*

Temperature Regulation
-The ability for the body to control its temperature is called thermoregulation
-Major changes in the core temperature of the body can be extremely dangerous
-Thermoregulation is achieved in the following ways:
- Evaporation: Heat is lost when sweat is evaporated from the body's surface. You sweat, the wind or body movement then cools you down. If it is humid, heat loss is not possible because you are hot and wet and the air is also hot and wet.
- Conduction: Heat exchange occurs when 2 objects of differing temperature contact each other eg. a tennis player gains heat from the court
- Convection: Heat is lost to the airflow across the body, A cool breeze causes heat loss eg. a swimmer in cold water will loose heat easily.
- Radiation: Heat radiates from a warm object to a cool object eg. on a warm day, the heat in the ground will warm up an athlete.

Climatic Conditions: temperature, humidity, wind, rain, altitude, and pollution
-Can have negative affects towards the body. Eg hypothermia (head and humidity), hyperthermia (cold and wind) which occur when there is a combination of extreme climatic conditions
-The body can struggle to regulate its core temperature in regards to the environment and outer temperature. Eg moving from hot to cold climate

Guidelines for Fluid Intake
-Fluid is lost during exercise, as intensity increases, so does the fluid loss. Extra fluid should be consumed in the days leading up to competitions.

300-600mL with the pre-event meal, 150-300mL every 15-20 minutes up until about 1 hour before the event.
-Keep fluid loss to below 2% of body weight.

Acclimatisation
Athletes need time to acclimatise to weather, altitude, food etc. Heat acclimatisation takes between 7-14 days for major effects to take place. It takes 2 weeks to acclimatise to higher altitudes; benefits include increased red blood cells and blood capillaries and improved heart function.
-The immediate responses to exercising at altitude are:
- Hyperventilation (increased ventilation) – occurs within a few hours upon arrival at higher altitude and stabilises after about one week
- Increased cardiac output – due to changes in hear rate, not stroke volume (that is, the heart beats faster, rather than each beat pushing out more blood)
- Increased blood pressure.

-The longer-term adjustments involve:
- Increase in the number of red blood cells and haemoglobin (in the first weeks)
- Re-establishment of the acid-base (pH) balance of body fluids (in the first few days)
- Changes to tissue and cells (after some time)

Taping and Bandaging
Taping uses adhesive and often rigid tape, while bandaging uses non-adhesive and usually elasticised bandages. Taping and bandaging are used in sports to prevent injury and assist in injury treatment and rehabilitation. For taping and bandaging to be effective the trainer or strapper must have a thorough knowledge of sports injuries, and an understanding of the anatomy and physiology of the human body.

Preventative Taping
- Taping or strapping for injury prevention, known as prophylactic taping involves the application of non-elastic adhesive tape that provides support and restricts any excessive movement that might result in injury
- This type of taping can also be used to hold in place protective equipment, such as shin pads or shoulder pads.
- The use of taping for injury prevention is common in sports where specific injuries can be anticipated
- Taping can never provide the joint with the same stability and support as are supplied by the body's natural supports
- Athletes are therefore encouraged to undertake strengthening exercises for the sites of the body where injury is more likely
- An additional advantage to taping is that when the joint over-extends, the tape pulls on the skin of the athlete and this can make the athlete aware of the joint position more quickly, allowing the athlete to initiate muscle action to correct the situation
- During the rehabilitation process taping can provide strength, stability and prevent re-injury
- Guidelines for effective preventative taping:
    - Use tape that is correct width and length for the body part
    - Avoid the use of elasticised bandages as they do not provide effective support
    - Ensure both the player and the person applying the tape are in a comfortable position
    - The person applying the tape must pull it from the roll and not use the player's limb as an anchor
    - Maintain an even pressure when applying the tape – if the tape is too tight,

circulation can be restricted, if to loose it will be ineffective
- Maintain uniform application of the tape by overlapping the previous tape by about a half of the width on each turn
- Once the tape is applied, ensure that circulation is not being restricted
- Remove tape immediately after training or playing

Taping for Isolation of Injury

- A major aim of taping is to limit movement, or allow only limited movement
- When a joint has been injured, to prevent additional damage and to promote recovery, taping can be used to isolate or immobilise the joint
- If done correctly taping can isolate the joint and prevent extreme movements that might have an import on the healing process
- For example, a sling can be applied to an injured shoulder to prevent movement and further damage

Taping for Immediate Treatment of Injury

- Usually elastic, but sometimes can be a combination of elastic and non-elastic
- The most common use of taping for immediate treatment of injury are:
  - To control bleeding and prevent infection
  - To apply pressure that will reduce swelling
  - To immobilise and support the injured part
- Bandages applied correctly contribute significantly to the rehabilitation process, if carelessly applied they will cause discomfort, allow for possible infection and actually hamper the repair process

Rehabilitation Procedures

Rehabilitation occurs after injury takes place, and can take significant amounts of time depending on the type and severity of the too:

- Restore optimal function of the injured area
- Return the athlete to competition quickly and safely
- Prevent re-injury

Progressive Mobilisation

Injuries involving the muscular or connective tissues surrounding a joint will restrict movement of that joint. Joint mobilisation is the freeing of hindered joints to allow improved range of motion.

Joint mobilisation can be achieved through active exercises (performed by the athlete) or through passive methods (manipulation of the inured part by another person). Mobilisation of the injured part should begin soon after the injury because joint inactivity can increase the formation of scar tissue. This process is known as progressive mobilisation because the range of movement is gradually increased over time until the full range of movement is resorted.

To ensure safe mobilisation of injured parts, the following precautions should be noted:

- Thorough checks should be made to ensure that there is no fracture at the site – an x-ray may be required
- Mobilisation should not be commenced during the acute inflammatory phase
- Circulation to the injured area should be increased before commencing mobilisation
- The athlete should be relaxed before and during mobilisation
- Movements should be slow and progressive, rather than sharp and rapid
- Movements should remain within a pain-free range

Graduated Exercise

Stretching

- Loss of flexibility occurs as a result of injury to muscle and connective tissues, and the formation of scar tissue
- A degree of flexibility will be returned to the site through progressive mobilisation
- If completed correctly, these will enhance rehabilitation by:
    - Reducing muscle tension
    - Increasing circulation
    - Increasing muscle and tendon length
    - Increasing the range of motion

Flexibility, in common with mobilisation, is restored gradually to the injured area through the use of slow static stretches and PNF stretching early in the repair phase. The advantage of PNF stretching is that it does not require the injured site to be moved extensively, it also stimulates proprioceptors within the muscle and connective tissue.

Passive stretching – with machines, partners, coaches or physios is very common in sports rehab. The purpose is to lengthen soft tissue beyond its normal resting length by applying external force.

Conditioning

- The restoration of muscular strength is essential in injury rehabilitation
- Muscles that are active will increase in size and endurance whereas those that remain passive will decrease in size
- Even if the area is immobilised, a program should be designed to prevent muscle atrophy (wasting muscle tissue)
- Isometric exercises should be used to develop strength in the position exercised and involves no movement of the joint
- As swelling and pain lessen, exercises involving pain-free movement can be introduced
- As strength is slowly regained, further resistance can be applied
- The introduction of weight-bearing exercises can be considered if the injured area is thought to be capable of support
- Isokinetic exercises are considered beneficial at this stage because they will develop strength through the full range of movement using uniform resistance
- It is important to monitor both the agonist and antagonist muscles, this will ensure that an appropriate ratio of strength is being developed

Total Body Fitness

- A program of rehab must involve both restoration of the injured part to full function and the maintenance of overall body fitness
- Maintenance of flexibility, strength and endurance should be promoted with activities that are specific to the sport or activity and that do not endanger recovery from injury
- The choice of exercises to maintain total body fitness will depend on the type and severity of the injury
- Activities to promote total body fitness during rehabilitation include:
    - Treadmills
    - Rowing or cycling ergometers
    - Swimming and water resistance activities
    - Weight training
    - Walking or light jogging

Training

An athlete who has finished a treatment and rehabilitation program is not ready to return to full competition, even though the athlete might have regained flexibility and a full range of movement, strength and full body fitness may be returned to normal, the athlete is still not ready physically and emotionally for competition.

- Risk of re-injury
- Movement skills, specific game skills and confidence have not been re-established
- Timing, speed and coordination affected by rest from competition

In preparation for the physical and psychological demands of the competition the athlete must undertake active training.

The final stages of rehabilitation involve developing muscle coordination and speed to full capacity. The athlete must be able to display skill proficiency equal to that of the athlete's pre-injury performance standard, including ability to delay fatigue.

An athlete who 'favours' the injured part increases the risk of re-injury ti the sire or a new injury to a different site. That is, attempts to protect the injured area.

Training before recommencement of competition must be aimed at re-establishing all skills in an environment that is as close as possible to competition conditions. Only when full fitness and coordination movements and skills are shown should the athlete resume competition

Gradual, sport specific program will allow the athlete to develop the physical and psychological skills required for competition. Some athletes may be asked to play at a lower level prior to resuming at the level they were competing at prior to injury.

Use of Heat and Cold

Heat, cold, pressure and electrical stimulation are some of the modalities (forms of treatment) used in sports rehabilitation. In general, the choice of heat or cold modalities after the acute phase is dependant on the type of injury and often the patient's preference.

Heat

Increase circulation, either generally (in a large body area) or locally (at a given site). Superficial heating is heating to a depth of about 1cm whereas deep heating occurs at a depth of greater than 1cm.

General physiological responses of the body to heat are:

- Decreased pain
- Increased ability to stretch
- Relaxation
- Increased blood flow
- Reduced joint stiffness
- Decreased muscle spasm
- Enhanced inflammatory response (increased flow of blood/fluid to area)
- Increased tissue healing

Heat is applied through heat packs, hydrotherapy, infra-red lamps and contrast baths.

Cold

The application of ice to an injury is one of the most common cold modalities. The term used to described the use of cold for treatment is 'Cryotherapy', most common form of applying this treatment is ice pack (frozen gel), ice bag (ice filled plastic bag wrapped in a towel), an ice massage, ice immersion, a contrast bath (hot and cold) or a tropical cold spray.

Cold modalities are commonly used:

- In the acute phase of injury treatment
- After therapeutic exercise of injured sites
- Used to reduce pain and swelling related to chronic and/or overuse injuries

The application of cold to an injury site has the physiological effects on decreasing:

- Swelling
- Circulation to injured site
- Actuate inflammation
- Pain and discomfort
- Muscle spasm
- Tissue metabolism

When used with rest, compression and elevation, cold treatment is especially effective in the treatment of swelling and pain associate with acute injuries. Stiffness can be caused after cold treatment. Care should be taken during the application of Cryotherapy to avoid things like frostbite and other skin and nerve damage.

Return To Play

- Injury is fully recovered and athlete's fitness has returned to a pre-injury state
- Lack of confidence to the site will hinder psychological and physical performance
- The athlete should not push the coach or medical staff to make a hasty or inappropriate decision

Indicators of Readiness to Return to Play

Being pain free and having mobility return to the injured area are indicators of the readiness for return to play. There are many physical test that can occur to measure an athlete's readiness to return to play, many of these test are basic fitness and skills test that are used throughout the season and measure an athlete's readiness and ability to resume play. These test are useful because they provide a full point of comparison of the athlete's previous test results, eg. preseason results

Monitoring Progress (Pre and Post test)

The physical and the physiological condition of the athlete should be monitored when the athlete returns to play. This might involve:

- Visual observations of the athlete
- Interviews and discussions with the athlete
- Ongoing testing (comparison of results pre-injury to current status)
- Observation of video footage of the athlete
- Use of performance-evaluation sheets

The athlete will benefit from feedback about performances. Appropriate visits to medical professionals to monitor the injury are also advisable, to prevent re-injury to the area and to provide medical assistance if needed eg. massage. Ongoing therapy is advisable until the athlete returns to pre-injury levels.

Psychological Readiness

The psychological readiness of the athlete can be measure by less informal means, such as discussion and observation of behaviour. Anxiety levels can also be monitored to ensure the athlete is not feeling pressure (internal or external) to return to play before being fully ready to do so. Taping the injured area can provide support and proprioceptive awareness to the athlete; it can be a physiological form of treatment long after the injury is recovered.

Specific Warm-Up Procedures

Injured athletes may benefit from a longer, harder or more specific warm up and stretch routines than other athletes. Time and care is needed at the injured site and surrounding tissue area to ensure adequate flexibility, blood flow and readiness to perform. Warm ups can be specifically designed by the athlete, coach or physio to minimise the chance of re-injury.

Return-to-Play Policies and Procedures

- Vary with sports
- Coaches, sports administrators and sports medicine practitioners play and important role in establishing guidelines for the athlete who are managing injury and deciding whether to play with the injury or when to return to play
- Determined by overall governing bodies or by individual sporting clubs themselves
- Depends on the nature and severity of the injury
- Priority must be given to player welfare with medical advice guiding decisions and policy

Ethical Considerations

Pressure to Participate

The decision to return to play has short term and long-term considerations. If the athlete does not allow for an appropriate recovery period after injury they place themselves at further risk of complications to the area of injury. Various internal and external pressures push athletes to make the decision to return to play.

Internal Pressures include:

- Boredom
- A drive for success
- A fear of loosing one's position in the team
- A sense of letting down the team

External Pressures include:

- Financial pressures
- Pressure from the media
- Pressure from sponsors
- Expectations of other players, family or the coach
- Pressure from spectators

If an athlete returns prematurely after injury it might cause the injury to become further established. This will extend necessary recovery time, and the athlete ends up losing more time than needed if they had appropriate recovery time initially.

Use of Painkillers

- Becoming more common in sports
- The pressures on athletes to return to performance increase through the use of these medications
- Pain-killing drugs are attractive to athletes and for clubs who rely financially on their athletes taking the field
- With financial and various other pressures increasing, and with advances in drug technology, the use of medications to allow athletes to return to play before full recovery is an increasingly important issue.