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The role of sports medicine in physical education

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Abstract
Sports medicine is an area of medical practice concerned with the treatment of injuries resulting from athletic activities. A physician practicing sports medicine focuses on sports-related medical services. This may include preventative measures such as conditioning and injury prevention, as well as treatments such as osteopathic manipulation, rehabilitation, or injections. Sports medicine physicians will often treat athletes with back pain due to strain and injury placed on the back from various sports including bicycling, weight lifting, running, and golf. In the field of physical education and sports, the fields of various sub-disciplines of sports medicine are utilize. Without the knowledge of scope of sports medicine, it is difficult to carry a sportsperson performance at apex level.

Keywords: Sports injuries, exercise, sports, physical education

1. Introduction
Sports medicine is a wide medical field that deals with sports related injuries and ailments. The role of sports medicine has continued to gain prominence as more and more people engage in sports. Practitioners of this medical field are well trained in physical and emotional aspects related to sports activities and how to treat them. It is a specialization that has become more lucrative due to the high costs associated with keeping top athletes in to form.
Sports medicine is not only restricted to medical procedures such as surgery and medication. The practice has grown to include specialists in other health and wellness professions such as nutritionists, psychologists, and personal health managers or coaches. Each specialist is well trained in his or her field of specialization with most having at minimum a bachelor's or graduate degree. Due to the growth in popularity of sports medicine, experts in other forms of medicine have specialized in this field after practicing for some years. For example, an orthopedic surgeon who starts getting a stream of patients with sports related ailments and injuries might as well decide to specialize in sports medicine [1].
Every athlete understands the potential for injury is always present and the wisest step to take after the occurrence of an injury is to seek for the services of a sports medicine professional. The specialist is an expert who has the capacity to give valuable advice to prevent what might seem like a minor injury from developing into a serious health issue. A sports medicine professional is also capable of offering the best nutritional advice to enhance the performance of an athlete. Sports medicine also plays a major role in recovery and pain relief efforts for sports related injuries. Other types of injuries from falls or accidents such as bone fractures and ligament tears can be handled by sports medicine specialists [2].

2. Scope of sports medicine [3, 4]
In the field of physical education and sports, the fields of various sub-disciplines of sports medicine are utilize. Without the knowledge of scope of sports medicine, it is difficult to carry a sportsperson performance at apex level. There are following scope of sports medicine:
a) Sports and first aid
b) Human anatomy and physiology
c) Female and sports
d) Study of optimal load for different age groups
e) Scientific promotion of games and sports
f) Sports injury rehabilitation
g) Fitness for games and sports.

3. Reaction to injuries

Kubbler and Ross model of athletic reaction to injury [5].

3.1 Denial

At the beginning, the athlete cannot believe the injury is severe or that it will impact their ability to continue with their sport. They may still believe in the myth that "no pain means no gain". If so, they have been living under a rock for quite some time. Pain is an indicator that something has gone wrong and needs immediate attention. The realization that the pain is stopping them from participating leads to the next stage.

3.2 Anger

Denial quickly turns to anger as the reality of the situation settles in and the athlete is forced by the circumstances to alter or even stop their participation in their sport. Recovery is often not an easy path and the athlete becomes frustrated and more irritated with the pace of the rehabilitation process. At this point, the coach is in an ideal position to be a sounding board for the athlete's exasperation, and help ease their aggressiveness toward the athletic trainers who are trying to get them back in shape. Realizing the athlete is angry at their loss of ability to perform, their loss of power over what has happened to them and the current situation they now find themselves in are important points to keep in mind while dealing with the individual.

3.3 Depression

Self-worth becomes an issue at this point in the process and depression sets in due to the reality of the situation now being fully realized. The athlete begins to feel as though he or she has no physical or emotional control. The team continues onward without them, which leaves a void in their life and this leads to feelings of isolation, further self-doubt and lowering of their self-esteem. Hope for a successful outcome becomes cloudy and they may not see any good coming from the rehabilitation process.

You as the coach will have the most difficult time during this stage as the athlete may stop going to rehab, to team practices or even talking to you. You must continue talking to them by providing encouragement. Explain to them the progress they have made and keep them engaged in their recovery. Once they have completed the journey through this stage, they enter the final one, acceptance and recovery begins in earnest.

3.4 Acceptance

Acceptance of the full enormity of the circumstances they find themselves in begins the physical and emotional healing process. Once this stage is entered an attitude change is noticed and the real work towards full recovery begins.

Not one of the four stages of grief will be lit up with flashing lights and banners waving in the air. They are gradual movements into and through each one. There may even be periodic lapses back and forth into previous stages. So expect these setbacks. In many cases, they are only temporary. However, if extremes in mood are continuous and seem to remain locked into one part of the process it is incumbent upon you as their coach to recommend they seek additional professional assistance in managing the problem.

In each instance recognition of the particular stage of grief is a key factor in providing assistance toward the full recovery of their athletic prowess. Effective communication by the coach, providing education as to what is happening to their body, supporting the recover and cooperatively setting goals will help ensure positive progress is made after the injury.

3.5 Frustration

The most common cause of frustration due to injury is likely to come as a result of the rehabilitation process, either frustration at having to do it or more commonly frustration at the lack of progress, this may sometimes be due to it actually taking longer than expected or simply the individuals impatience and eagerness to get participating in their sport again, any good rehabilitation schedule will follow S.M.A.R.T principles (Specific, Measurable, Achievable, Realistic and Time based), particularly that it should be time based and that this be of a realistic time frame, for instance setting a target for Arsenals Aaron Ramsey to return to top flight football in a time frame of 1 month after breaking his leg would have been unsuitably unrealistic. Setting an unrealistically optimistic target is likely to frustrate the individual when they fail to meet it.

4. Causes of sports Injuries: [6]

Sports injuries are most commonly caused by poor training methods; structural abnormalities; weakness in muscles, tendons, ligaments; and unsafe exercising environments. The most common cause of injury is poor training. Sports injuries are most commonly caused by poor training methods; structural abnormalities; weakness in muscles, tendons, ligaments; and unsafe exercising environments. The most common cause of injury is poor training. For example, muscles need 48 hours to recover after a workout. Increasing exercise intensity too quickly and not stopping when pain develops while exercising also causes injury.

4.1 Improper Equipment

If you use a weight or a racquet too heavy for you, lower back or arm pain may follow. Ill-fitting helmets and shoes may also cause injuries. A runner may experience an injury if he wears shoes that do not provide enough support. Plantar fasciitis, the inflammation of your arch's shock absorber, is common when shoes do not fit properly or provide proper support.

4.2 New or Increased Activity

Starting a new activity or increasing your level of activity too quickly can also result in plantar fasciitis or lower back pain. If you have begun a new exercise or sport, previously unused muscles may be employed or you may increase the work of other muscles. A cramp is a common result of this.

4.3 Fatigue

Tired muscles are a common cause of muscle pulls. Resting between activity is essential to preventing muscle pulls.

4.4 Poor Warmup

Your elementary school gym teacher probably told you how important it is to stretch before any athletic endeavor, and he was right. Muscle cramping and pulls are often the result of jumping into an activity without properly easing the muscles into it. Warming up delivers blood and oxygen to the various muscles, allowing them to work more efficiently. Many sporting injuries could be prevented by carrying out a thorough warm up prior to physical activity and a suitable cool down session after exercise has ceased. The warm-up should be an essential part of any training session and should be carried out before all sporting activities.

4.5 Impact
Hard impacts are another culprit behind injuries such as shin splints and plantar fasciitis. Hard surfaces cause a more jarring impact on an athlete's feet, legs, hips and back.

4.6 Unilateral Movements
Lower-back pain plagues some golfers and tennis players, among others. Because these activities require certain movements by only one side of the body, you are working muscles on one side without doing equal work on the other. This can result in weaker muscles on the less active side, the most common cause of lower back pain.

4.7 Technique or Posture
Neck pain, including spasms and pulls, is often the result of something as simple as moving your head awkwardly to see a ball or an opponent. Cyclists may experience neck pain after riding with racing handlebars. The position you must take to use the handlebars and still see where you're going tightens the neck muscles, causing a spasm.

4.8 Overuse
Overuse or repetitive movements may be the number-one cause of sports injuries. Runners, swimmers and tennis players are particularly susceptible to overuse injuries, including tennis elbow, tendinitis, shin splints and shoulder impingement. Overuse is a common cause of injury in professional sports players. Overuse injuries are usually progressive rather than acute. Repetitive strain injuries are examples of overuse injuries.

4.9 Stops and Twists
Sports that incorporate quick stopping and twisting motions -- including basketball, gymnastics and soccer see a high number of knee and ankle injuries. Ankle sprains occur when an athlete rolls his foot and stretches the surrounding ligaments. The stabilizing muscles and cushioning cartilage around your knee, shoulder and other joints are prone to tearing from an uncontrolled twist or a sudden stop.

4.10 Impact and contact
Several sports players endure injuries that are caused by impact or contact with objects, surfaces or other people. Injuries caused by impact and contact are common contact sports such as football and rugby and more dangerous sports such as motor racing, boxing and skiing. Often, contact with other people can cause an athlete to be off balance, which may cause them to twist or change direction quickly; this often causes damage to connective tissue; powerful direct contact may also cause a joint to become displaced.

4.11 Over training
Over-training is a condition which involves applying too much stress to the body by means of physical activity. Training is an integral part of an athlete's success and in most cases, training will enhance an athlete's performance; however, if the body is stretched too far, performance will almost always decrease The most common causes of over-training are a lack of recovery time and an increased intensity of training; over-training is common in the lead up to big events and after injuries.

4.12 Poor technique
Many overuse injuries are attributed to doing repetitive actions with poor technique; this can cause excessive pressure to be applied to particular joints or muscles which can contribute to an injury; tennis elbow, for example, is often caused by having poor backhand technique. Over time symptoms of injuries caused by bad technique will be exacerbated and could lead to a more serious condition. Poor technique can also lead to more acute injuries; this can be common with misuse of exercise machines in the gym for example, where a muscle or area of soft tissue can be suddenly stretched.

4.13 Effects of bad technique
Injuries are not the only by-product of poor technique; performance levels will also be decreased by bad technique as this will prevent optimum strength, power and speed in the particular movement or shot.

5. Treatment and prevention of sports injuries

Treatment of sports injuries is based on the RICE principle: [7]

- Rest
- Ice
- Compression
- Elevation

Rest stops new injury and bleeding. Ice eases pain and reduces inflammation by constricting the blood vessels. Elevation and compression limit the amount of swelling and fluid accumulation around the injured area.
Ice should be crushed to better conform to your shape. It should be placed in a bag that is wrapped around the injury. First, put a towel between the bag and the skin. Then, wrap a bandage around the ice bag, not so tight as to cut off blood flow. Ice only constricts blood vessels for about 10 minutes, after which they "rebound." For very new or traumatic injuries you should leave the ice in place for only 10 minutes at a time, removing it for the same period. Alternate like this for an hour or two, keeping the injury elevated all the time.
You should carry out this procedure several times during the first day or so after injury. Following this, ice can be used for longer periods to better reduce swelling and pain. You can apply ice for up to 30 minutes several times a day. Packages of frozen peas or corn are excellent ready-made ice packs. If the injury is in the leg or ankle, don't try to stand up the first day, and do your best to keep it elevated as much as possible.
There is also some evidence for using chiropractic techniques, such as manipulative therapy and full kinetic chain or exercise therapy, to help manage ankle sprains. [8]

5.1 You can reduce your risk of sports injuries if you: [9]

- Warm up thoroughly by gently going through the motions of your sport and performing slow, sustained stretches.
- Wear appropriate footwear.
- Tape or strap vulnerable joints, if necessary.
- Use the appropriate safety equipment, such as mouth guards, helmets and pads.
- Drink plenty of fluids before, during and after the game.
- Try to avoid exercising in the hottest part of the day, between 11 am and 3 pm.
- Maintain a good level of overall fitness, particularly in the off season (in the months between playing seasons for a sport).
- Cross-train with other sports to ensure overall fitness and muscle strength.
- Ensure training includes appropriate speed and impact

work so muscles are capable of the demands of a game situation.
- Don't exert yourself beyond your level of fitness. Gradually increase intensity and duration of training.
- Use good form and technique.
- Cool down after sport with gentle, sustained stretches.
- Allow adequate recovery time between sessions.
- Have regular medical check-ups

6. Sports Emergencies

6.1 Management of CPR: [10]

Cardiopulmonary resuscitation (CPR) consists of the use of chest compressions and artificial ventilation to maintain circulatory flow and oxygenation during cardiac arrest. Although survival rates and neurologic outcomes are poor for patients with cardiac arrest, early appropriate resuscitation—involving early defibrillation—and appropriate implementation of post–cardiac arrest care lead to improved survival and neurologic outcomes.

6.1.2 Check Responsiveness

- Tap the person's shoulder and shout, "Are you OK?"
- Look for normal breathing. Call ambulance if there is no response.
- Start Hands-Only CPR.
- Hands-Only CPR should not be used for adults whose cardiac arrest is due to drug overdose, near-drowning, or an unwitnessed cardiac arrest. In these cases, do a conventional CPR combination of chest compressions and rescue breathing.

6.1.3 Do Chest Compressions

- Place the heel of your hand on the center of the person's chest.
- Place the heel of your other hand on top of your first hand, lacing fingers together.
- Keep arms straight and your shoulders directly over your hands.
- Push hard and fast, compressing chest at least 2 inches.
- Let chest rise completely before pushing down again.
- Compress at least 100 times per minute.

6.1.4 Stop Only if

- The person starts breathing normally.
- A trained responder or emergency help takes over.
- You are too exhausted to continue.
- There is an automated external defibrillator (AED) to use.

6.1.5 Use an AED as Soon as One Is Available

- Turn on the AED. It will give you step-by-step instructions.
- Wipe chest dry.
- Attach the pads.
- Plug in connector, if needed.
- Make sure no one is touching the person. Say "Clear" so that people know to stay back and not touch the person.
- Push the "Analyze" button if necessary.
- If a shock is advised, push the "Shock" button.
- Resume compressions and follow AED prompts.

6.2 Management of Shock

To discuss the management of shock we should considers hypovolemic, cardiogenic and septic shock.

6.2.1 Hypovolemic shock [11]

Regardless of the cause, the key intervention in the management of hypovolemia secondary to blood loss is to stop the bleeding. This is rarely possible in the out-of-hospital setting as significant external hemorrhage in this context is rare. Internal hemorrhage, whether it arises as a result of a traumatic injury or from a medical condition, such as a leaking aortic aneurysm, commonly requires the intervention of a surgeon to arrest bleeding.

The two most effective interventions are therefore a short insult to surgery time, best facilitated by rapid transfer in an ambulance, and pre-alerting the receiving hospital. Moving the patient should only be delayed to ensure the airway is patent and protected, oxygen is administered and any life-threatening breathing problems are corrected. On the rare occasions in which significant external bleeding is present, it should be managed with direct pressure to the wound, laying the patient flat, elevating the injured limb and applying a second pressure dressing over the first.

If necessary, the bandage can be tightened using a windlass - a pen inserted under a layer of the bandage, which is then twisted and tied off. Ribbon gauze impregnated with hemostatic agents has recently become available and is highly effective in promoting clotting when used to pack wounds when bleeding cannot otherwise be controlled.

If no other interventions are successful, a tourniquet should be applied close to but proximal to a limb wound. Ideally it should be broad and should be tightened until the bleeding stops, and never be loosened outside of an operating theatre. An adequately tightened tourniquet will be painful, requiring IV analgesia. Oxytocic agents can be used to control significant primary post-partum hemorrhage and severe bleeding subsequent to an incomplete miscarriage.

6.2.2 Cardiogenic shock

Cardiogenic shock may occur subsequent to heart failure following an acute MI, following rupture of a septal infarction, or due to an arrhythmia. Patients with evidence of hypoxia should be given high concentration oxygen and will usually be more comfortable sitting up. Brady arrhythmias resulting in hypotension should be managed with IV atropine 500 micrograms, repeated to effect at three-minute intervals to a maximum of 3mg. The preferred treatment of tachycardia with shock is cardioversion and this will commonly be delayed until arrival at hospital.

6.2.3 Septic shock

Hypotension in septic shock results from leakage of circulating volume into the interstitial space through a leaky capillary bed. Although septicemia will occur following the systemic spread of any infection, meningococcal septicemia is arguably the greatest concern in pre-hospital care. Any patient with recent onset of flu-like symptoms and pyrexia should trigger suspicion if these are associated with a rapid deterioration and any combination of headache, altered mental status or conscious level, photophobia, stiff neck, convulsions or cardiovascular compromise.

6.3 Management of Frost bite: [12]

Frostbite is an injury that is caused by exposure of parts of your body to temperatures below freezing point. The cold causes freezing of your skin and underlying tissues. The fingers, toes and feet are most commonly affected but other extremities including the nose, ears, and the cheeks can also develop frostbite.

Usually your blood carries oxygen to all parts of your body so that your body tissues are kept healthy. As a protective response, when your body is exposed to extreme cold, blood vessels narrow (constrict) so that blood (and oxygen) are

diverted away from your extremities to your vital organs to keep your body alive. After some time, this lack of blood supply and oxygen to the skin can start to cause damage to the cells.

In areas of the body affected by frostbite, ice crystals form and cells and blood vessels become damaged. Blood clots can also form in small blood vessels which further reduces the chance of blood and oxygen getting to the affected tissues. The chance of frostbite is increased the longer that you are exposed to the cold temperatures. If the cold temperatures are accompanied by wind (producing wind chill which brings the temperature down further) or high altitude there is a greater risk. Generally, frostbite is worst in lower temperatures.

6.3.1 First aid treatment

Some basic first aid for frostbite injuries includes:

- You must get shelter from the cold.
- Change wet clothing for dry clothing. This reduces the chance of further heat loss from your body.
- Let the area air dry - don't rub the affected area, as this can cause further tissue damage.
- Remove any jewelry, such as rings on fingers, or other material that could tighten around the area.
- If your hand or a foot is affected by frostbite, wrap it in a blanket for protection.
- If possible, avoid walking on frostbitten feet, as fractures can occur as well as chipping of the affected tissue.
- Protect from any possible re-freezing.
- Try to ensure the person is rehydrated. Rehydration means making sure a person takes in enough water to make up for lack of water in the body (dehydration).
- Treat hypothermia and any other injuries.

6.3.2 Re-warming treatment

The aim is to start this as soon as possible. However, if there is a chance that the affected area could re-freeze then it is safer to keep it frozen until safe. Most frostbite will slowly thaw without any special measures and it should be allowed to do so. There should be no deliberate attempt to keep areas frozen.

If someone has been in the mountains and has developed frostbite, they may have other life-threatening problems that need to be treated first. Rapid re-warming can be done using heated water which should be kept at 37-39°C. This could take 30 minutes. The affected area should not be massaged, as this can cause further injury.

Re-warming is usually repeated twice a day. It is important to keep your skin warm and dry in between treatments

6.4 Management of Heat stroke: [13]

Heatstroke is a medical emergency and continues to be one of the leading causes of preventable death in sports. Rapid reduction of the core body temperature is the cornerstone of treatment because the duration of hyperthermia is the primary determinant of outcome. Except for the mildest cases, patients diagnosed with exertional heatstroke (EHS) or no exertional heatstroke (NEHS) should be admitted to the hospital for at least 48 hours to monitor for complications.

Once heatstroke is suspected, cooling must begin immediately and must be continued during the patient's resuscitation. The American College of Sports Medicine recommends that cooling be initiated at the scene, before transporting the patient to an emergency department for further evaluation and treatment. Despite extensive education and training, delays are still reported due to trepidation by athletic trainers to accurately diagnose and rapidly initiate treatment for EHS.

Controversy still exists over what therapeutic modality is most effective in the treatment of heatstroke. However, the basic premise of rapidly lowering the core temperature to about 39°C (to avoid overshooting and rebound hyperthermia) remains the primary goal.

According to one study, oral temperature assessments consistently reflected inaccurate core body temperatures, which delayed the diagnosis and ultimate treatment of patients with heatstroke. Rectal temperatures are still the preferred method of accurately obtaining core body temperatures.

Some studies have shown that promptly reducing the exposure time to excessive heat can dramatically improve long-term outcomes and decrease irreversible injury. If treatment is initiated within this so-called golden hour and is aggressive enough to rapidly reduce the core body temperature, complications (including multisystem organ failure) may be averted and the patient may have a much better prognosis.

Removal of restrictive clothing and spraying water on the body, covering the patient with ice water–soaked sheets, or placing ice packs in the axillae and groin may reduce the patient's temperature significantly. Patients who are unable to protect their airway should be intubated. Patients who are awake and responsive should receive supplemental oxygen.

7. Cryotherapy [14]

Pain and muscle spasms are common responses to injury. Tendons and ligaments are tissues that connect muscles and bones to each other and to other tissues. The basic building material of muscles, tendons, and ligaments is a protein called collagen. Under normal conditions, collagen acts like a rubber band: It stretches when tension is applied (as when we pull a rubber band) and returns to its normal length when the tension is released. However, when the collagen is stretched too far, it tears. In this tearing process, blood vessels are torn and blood cells and fluid escape into the spaces among the muscle fibers. This is sometimes visible on the surface of the skin as a swollen, bruised area.

Cold applied to the area decreases the flow of this fluid into the tissues and slows the release of chemicals that cause pain and inflammation. Cold decreases feeling in an area by reducing the ability of the nerve endings to conduct impulses. It may also reduce pain by "countering" the injury. For example, you might counter the pain of a sore tooth by pinching yourself hard in the leg.

Cold also decreases the activity of cells to reduce swelling and internal bleeding at the site of acute injury. Cooling the deep tissue also reduces muscle spasm by reducing the muscle's ability to maintain a contraction (contractility). Because cold reduces bleeding and swelling within injured tissue, it is best used in the first 48 hours after an injury and usually longer after a surgery. However, cold therapy (cryotherapy) is not for everyone.

7.1 Ice baths

An ice bath can easily be made by half-filling a large container/tub with cold water and ice. The size of the container and depth of the water required depends on the body part to be treated. This is the best method of cooling awkward, bony areas, such as the foot, ankle, hand and elbow. Immediately following injury, submerging the injured body part may not be as beneficial as using a cold pack and compression wrap, as there is no compression (RICE principle). Wrapping the ankle prior to submersion will also prevent maximal cooling by insulating the body part.

7.2 Ice massage
Ice can be used to massage the affected area. Usually cubes are frozen with some form of handle (a simple lollypop stick will suffice) in order to protect the hands of the masseur. This method is most suitable for injured muscles and larger areas. The ice should be stroked up and down the injured muscle. The disadvantage of this type of massage is that the application is phasic, that it the ice is in contact with each area only briefly. Following this it is exposed to air temperature which reduces the efficacy of tissue cooling. However, numbing of the area is quite efficient due to the movement of the ice stimulating mechanoreceptors in the muscles.

7.3 Gel packs
These commercially available packs contain a gelatinous substance which is kept frozen in a freezer until required. Better examples contain some form of anti-freeze which prevents the gel from freezing into a rigid position, allowing the pack to be molded to the shape of the body part. These are good for use in a clinic setting as they are re-useable and not as messy as ice packs. However, when taken out of the freezer they immediately begin to thaw and so are not suitable for use on the field of play. They must also be applied to the skin through a towel or cloth to prevent frostbite.

7.4 Chemical cold packs
These are one use cold packs where compressing and rupturing a central pouch, contained with the pack, releases a second chemical which causes a reaction which lowers the temperature of the pack. These packs do not lower in temperature enough to significantly reduce tissue temperature. They are however convenient for emergency use. Any leak from the pack would cause a chemical burn.

8. Hydrotherapy [15]
Hydrotherapy is the use of water in the treatment of different conditions, including arthritis and related rheumatic complaints. Hydrotherapy differs from swimming because it involves special exercises that you do in a warm-water pool. The water temperature is usually 33–36ºC, which is warmer than a typical swimming pool.

You'll normally have hydrotherapy treatment within a hospital's physiotherapy department. Usually a physiotherapist or a physiotherapist's assistant with specialist training will show you how to do the exercises. The focus of the exercises can be adjusted to help your range of movement or strength, depending on your symptoms.

Hydrotherapy tends to be different to aquaponics, which can be quite strenuous, as it's generally more focused on slow, controlled movements and relaxation.

Common Hydrotherapy Techniques
8.1 Warm and Cold Foot Bath
These hydrotherapy techniques involve dipping feet in warm water 36oC (97oF) for about 10 minutes then a brief dip in cold foot bath. This helps stimulates blood vessels to treat varicose veins and sprains. It may be effective in treating cold feet, bladder infections, headaches and insomnia. If you have high blood pressure, do not use warm water bath.

8.2 Steam Inhalation and Bath
Boiling water is placed in a large pot and the steam inhaled to relieve nasal congestion and sinusitis (sinus infections). On the other hand, steam baths are effective for treating pain, allergies, asthma, bronchitis and skin disorders. Do not use these treatments if you have hypertension.

8.3 Hip or Sitz Bath
With this treatment, only the hips are soaked in cold or warm plain water or saline solution to treat vaginal discharge, uterus cramps, hemorrhoids, inflammation, constipation, prostate problems, and other abdominal problems.

8.4 Full Bath
An individual is dipped in warm water 32.2oC (90oF) – head not dipped – for about 20 minutes to enhance relaxation and circulation. Herbs, essential oils or salts may be added.

8.5 Cold or Warm Wraps
These hydrotherapy techniques are used to treat local inflammation and fever, and involve use cold or warm moistened linen clothes, which are wrapped loosely around the part of the body being treated. Dry clothes are then wrapped around the moistened cloth and left for about 1 hour. Warm wraps are used for treating respiratory conditions.

8.6 Warm or Cold Packs
A cloth may be soaked in hot plain water or hot herbal water, wrung out well and applied on the part of the body being treated. Warm packs promote the flow of blood and are effective against renal disease, arthrosis or osteoarthritis, cystitis and other pains.

Cold packs involve crushed ice placed in a plastic bag and applied for 1 minute then removed for 4 minutes. A piece of cooled blanket may also be applied. Apply a piece of dry cloth between the skin and ice pack to prevent frostbite. This treatment is effective against strains and sprains, headaches, arthritis and pleurisy (inflammation of the lining of the lungs).

8.7 Water Birth and Hydrotherapy
Water birth involves giving birth in a tub of warm water, now a popular trend in most developed nations. Giving birth in water is said to be beneficial to the mother and her baby. Most women opt for water birth because it induces relaxation and reduces pain associated with labor. In addition, water provides great buoys, which makes it easy for the mother to move herself and remain in a comfortable pushing/delivery position. Water birth also makes it easier for the baby to move through the birth canal.

9. Electrotherapy and heat [16, 17]
Electrotherapy and local modalities are used to assist pain reduction and the natural healing response via an increase in energy (electrical, sound, light, magnetic, temperature). Electrotherapy and local modalities have short-term benefits that can assist with the earlier introduction of other longer lasting techniques such as exercise prescription.

9.1 Ultrasound Therapy
Sound is mechanical vibration. The human ear responds to these vibrations in the range 20 Hz to 20 kHz. Sound above 20 kHz is called ultrasound. Therapeutic ultrasound is sound in the range 500 kHz to 5 MHz Sound waves are produced by some disturbance in a material medium causing the particles or molecules of the medium to vibrate. For this reason, sound will not pass through a vacuum.

If the vibration is continuous and regular a constant tone or frequency is produced. The vibration or sound wave propagates through the medium as particles in the medium pass on their vibration to neighboring particles and series of compressions and rarefactions are produced in the direction of travel of the wave. Therefore, sound waves are longitudinal waves.

9.2 Interferential Therapy

Interferential therapy employs medium frequency currents used in 2 or 4-pole configurations to produce a low frequency stimulation effect. Prior to the introduction of interferential therapy in the mid-1950s, low frequency stimulation was used for pain relief, muscle re-education etc.

These currents, however, have the disadvantage that normal human skin has relatively high impedance at such frequencies. In order to overcome the skin impedance a larger voltage has to be used to achieve the desired current, resulting in a more uncomfortable treatment for the patient. In addition, the penetration depth of these currents is poor and in part is limited by the discomfort to the patient.

9.3 Combination

In general terms, combination therapy involves the simultaneous application of ultrasound with an electrical stimulation therapy.

The main advantages of such a combination are said to be in:

- Localizing lesions (especially chronic) in diagnostic use
- Ensuring accurate localization of ultrasound treatment to provide increased accuracy/effectiveness in treating deeper lesions.
- Treating trigger points.

9.4 Shortwave Therapy

Shortwave refers to electromagnetic radiation in the frequency range 2 to 100 MHz Shortwave therapy is the application of electromagnetic energy to the body at shortwave frequencies. At these frequencies the electromagnetic energy is converted to thermal energy by the induction of circulating currents in the tissue and dielectric absorption in insulating tissue. Shortwave therapy units may produce output power levels of up to 500W providing significant heating to the area of the body being treated. For this reason, the treatment is often called shortwave diathermy (through heating). To avoid equipment such as shortwave therapy units interfering with radio communications, certain frequency ranges are designated by international agreement as ISM (Industrial, Scientific and Medical) bands.

9.5 Laser Therapy

The word 'LASER' is an acronym for Light Amplification by Stimulated Emission of Radiation. The first laser was demonstrated in 1960 and used a ruby as the lasing medium. Lasers have been used in many applications from surgery to bar-code readers at supermarket check-outs, from missile guidance systems to CD players. The first medical application was in the treatment of a detached retina. Laser therapy became a popular modality during the 1980s.

10. Sports Rehabilitation [18]

Injuries can occur in any sporting activity, and sports injury rehabilitation is a very important part of the athletes' sport life. Professional athletes in particular, are prone to injuries due to the excessive wear and tear associated with the demands of competitive sport. The right exercise program to maintain strength, flexibility and stability can help athletes recover quickly after an injury, empowering them to resume athletic activities.

Sports injuries, by definition, include injuries involving the musculoskeletal system. The musculoskeletal system includes the bones, tissues, muscles, and cartilage. Every injury is different and every person heals differently. The purpose of rehabilitation is to help the injured tissues recover in a controlled and supervised manner. It takes time for an injury to heal, and it's best to seek the guidance of an experienced physiotherapist during this time. The therapist can design a safe and effective recovery program specifically geared towards the individual's abilities. A physiotherapist can identify the cause of the injury and create a treatment plan to prevent future injuries and start sports injury rehabilitation.

10.1 Aim and Objectives

10.1.1 Restoring muscle strength

The first phase of rehabilitation is to progressively load the damaged (pathological) tissue (e.g. ligament, tendon or muscle) to restore its' strength (often referred to as tensile strength).

There is plenty of evidence to support this theory and if the load is too great for the damaged tissue to withstand, it will fail and healing will be back to square 1. Loading tissue that is repairing is a delicate process and should be led by pain felt during the exercise or the following day. Both of the latter usually indicate that the load during the exercise was too high and needs to be reduced. It is strongly advised to listen to your body and its reaction to exercise.

10.1.2 Restoring muscle endurance and power

Endurance is the muscles ability to work repeatedly without fatiguing. Muscle endurance is especially important in endurance sports such as long distance running or cycling but is also important in sports such as football and rugby which involve repeated bursts of exercise (called interval exercise).

Muscle endurance is also important for the body's core muscles which support the pelvis and spine and as their name suggests, they provide core strength whilst performing various exercises.

Muscle power on the other hand is the ability to produce force quickly. This is vital in explosive sports such as sprinting and long jumping. In order to improve muscle power, it is essential to have a good base of muscle strength.

10.1.3 Improve flexibility

Flexibility is the ability to extend or stretch without breaking. The term is usually used to describe muscles but can also be used to describe a movement involving a number of muscles (e.g. bending forwards in standing).

Whilst flexibility is very important, caution should be used in improving flexibility without also improving strength at the same time. If a muscle gets "longer" but not stronger then it will be weak in the additional flexible range and be prone to injury e.g. developing more hamstring flexibility by stretching without also strengthening the muscle.

10.1.4 Proprioception & balance

Proprioception is the human body's ability to detect movement and soft tissue stress and trigger a reaction to prevent injury e.g. reaction when stepping off a kerb to prevent an ankle sprain.

This is a very under estimated but extremely important part of the rehabilitation process for 2 reasons. Firstly, proprioception is often dampened or slowed down following an injury and needs to be re-trained and secondly, some people have poor generally proprioception and they are significantly more prone to injuries.

In essence, the way to improve proprioception is to perform exercises to improve balance and reaction times of the muscles surrounding the joints.

10.1.5 Functional exercises

Functional exercises are related to the sport or activity you are returning to. There are a number of generic exercises that can be applies to multiple sports and should be performed in the early stages of rehabilitation.

However, to effectively and efficiently return to the specific sport during which the injury occurred it is important to perform exercises that replicate activities and movements in that particular sport. For example, if returning to rugby, it is important to perform drills that are used in training such as tackling or passing. Muscles, ligaments and tendons adapt to the stresses and strains that they are placed under and therefore they adapt to specific activities and sports. It is important to bear this in mind when performing late stage rehabilitation.

10.2 Stages of Rehabilitation [19 , 20]

There are 3 recognized stages of rehabilitation and these are:

- **Early stage** rehabilitation is gentle exercise allowing for the damaged tissue to heal. This stage is often rushed and will result in poor quality healing and will be prone to re-injury.
- **Mid stage** rehabilitation involves progressively loading the muscles/tendons/bones or ligaments to develop tensile strength producing a healed tissue that will be able to withstand the stresses and strains of everyday life and exercise.
- **Late** - the final stage (late) of rehabilitation is where the tissue adapts and is stressed using functional exercises and drills to ensure the body is ready to return to play.

11. Conclusion

Sports medicine is a medical specialty that deals with both prevention and treatment of injuries and illnesses that are related to fitness and sports. Healthcare professionals in this field of medicine include physical therapists, orthopedic surgeons, coaches, trainers, etc. They work together as a team to help patients get back into shape as fast as possible and also in the safest possible way.

The presence of sports medicine is becoming more important these days. If you are an athlete or you engage a lot in different sports, make sure to consult a sports doctor. Just like a family doctor, a sports doctor is more familiar with your activities so it's easier to identify injuries and problems that might be brought about by sports. If you get injured because of sports and you consult other specialists instead of going for someone who is more specialized in sports medicine, there is a risk of having physician negligence.

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