CHAPTER I

INTRODUCTION

“Everyone has dreams. But in order to make dreams come into reality, it takes an aweful lot of determination, dedication, self-discipline, and effort” (Jesse Owens, four Olympic gold medalists in Berlin 1936). It is quite suitable for the athletes who are sweating for the medal in the international sports. Every sports men has a dream of winning a medal, however it is not possible to all, but a few. Sports are the combination of so many factors, which concedes articulation of extra denary movements like running 100 meters in 9.58 seconds, 800 meters in 40 seconds, jumping higher and longer, basketing the ball, hitting the ball in the air in volleyball. The so called factors which influences the sports performances are the physical fitness components, skill acquisition, advanced technical and tactical training, physiological and psychological adaptations. So to excel in sports one needs to do a lot. And at the same time there are certain obstacles to overcome; it needs patience, sacrifice, and above all the injuries which occur either during training or during competition while playing sports. It may be due to overuse of the joints and muscles and some risky movements during the game situation. The intention of this research is to study on the injuries and rehabilitations methods.
1.1 SPORTS PERFORMANCE

It is nothing but carrying out specific physical routines or procedures by one who is trained or skilled in physical activity. Examples are: To hit ball in the air in volleyball, to throw the shot to a distance, jump over the cross bar which is 2 meters high, shoot a ball into the basket, to defend the ball from entering the goal area in football, to hit a hockey ball into the goal area from penalty corner, etc. Technical and tactical perfection are very essential factors in sports. By mastering the skills of the concerned sports the performance could be enhanced. To carry out the regular practice no doubt the fitness components are mandatory. Performance is influenced by a combination of physiological, psychological, and socio-cultural factors.

1.2 PHYSICAL FITNESS

It is defined as a set of physical attributes that an individual has to achieve that relates to ability to perform a physical activity (Peter Kokkinos 2009). Physical fitness is the quality of physical well being that is characterized by a person’s ability to perform a specific task effectively with easy and efficiency (Dagoon 1996)

Numerous studies had revealed the importance of physical fitness for better sports performance. On review of physical education history, it was evident that, they insist the fitness for better health and wellbeing. Due to contemporary
changes in the field of sports, different training methods were formulated to improve the physical fitness by the scientist and trainers. The sports specific fitness and sports skills were also authored by the expert.

1.3 TRAINING

The dictionary meaning of training -“It is a process of learning the skills you need to do a particular job or activity” or it is a repetition of particular movement. According to kraemer (2006) training is a programme of exercise designed to improve the skills and to increase the energy capacity of an athlete for a particular event, therefore training is essential for the development of physical fitness components. Based upon the specific requirements the training could be prepared by the expert to attain the fitness level. It is not only for the development of physical fitness but to develop the technical and tactical aspects of the chosen sport, and even psychological aspects too.

1.4 SPORTS TRAINING:

Sport training is a physical, technical, moral and intellectual participation of an athlete with the help of physical exercises. It is a planned process for the participation of athlete and players to achieve top level performance. Sports’ training is the basic form of preparation for sportsmen, (Matwejew -1981)
Sports’ training is a scientifically based and pedagogical process of sports perfection which through systematic effect on psycho-physical performance ability and performance readiness aims at leading the sportsmen to high and highest performance (Harre-1981).

The systematic and regular use of physical exercises however does not guarantee maximum improvement in performance, but the effect of these exercises is increased by multitude of factors such as sports implements, verbal instructions, means of recovery, means of assessment of capacity, nutrition and psychological means and so on.

Training is much like constructing a multi storey building. One needs materials for the building such as aerobic, anaerobic running, comprehensive conditioning, flexibility, etc. several kinds of materials like training intensities and modalities should be utilized in an ongoing process to complete the goal of finished buildings or competitively fit athlete. Depending on the progress in the construction plan, the relative mix of all these materials will vary. As a training season develops, compressive conditioning work for strength of endurance will gradually form a transition into an emphasis on power with a substitution of intensity of volume in determining the total load.
1.5 PURPOSE OF SPORTS TRAINING

The purpose of the sports training programme is to produce metabolic, physiological and psychological adaptation that allows the sportsperson to achieve top level performance. When the training increases the demand for aerobic energy, the number and size of muscle mitochondria will increase so that in these chemical factors where aerobic metabolism takes place becomes larger and numerous. These will help athletes to acquire more energy from aerobic metabolism. There are three steps of adaptation; the first involves creating the need for more aerobic energy. Training must be sufficient in both duration and intensity to accomplish. The second step is to provide nutrients to build and repair mitochondrial tissues. Third is that the athlete must be given enough rest to regain the energy as super compensation. There are different types of training by which one can attain the required development. It is also an important factor for better sports performance.

1.6 PRINCIPLES OF SPORTS TRAINING

There are several universally accepted scientific training principles that are followed in programs to improve conditioning and performance. They are the principles of individual differences the principle of overload, the principle of progression, the principle of adaptation, and the principles of specificity. Training should be imparted individually because every athlete is different; each person's
response to exercise will vary. A proper training program should be modified to take individual differences into account. Over load principles is essential for adaptation process in the organism which ultimately lead to increase in performance capacity. The load has to be progressively increased to avoid over load which causes decrease in performance and injuries. Adaptation refers to the body's ability to adjust to increase or decreased physical demands, so to improve this principle is essential. The Specificity Principle simply states that exercising a certain body part or component of the body primarily develops that part, so it is also a considerable factor.

1.7 METHOD OF TRAINING

To enhance the fitness as well as skills training needs to be repeated. There are different methods of specific training programs that are available for the development of physical fitness components such as speed, muscular strength, muscular endurance, cardio respiratory endurance, coordinated abilities and mobility, and also skill performance. Training methods include weight training, interval training, fartlek training, circuit training, isotonic training, isometric training, isokinetic training and cross training. But before formulating training programme, the coaches or physical education teachers should keep in mind that the programme should be based on scientific principles training. Training programme should be designed to suit the specific energy sources need for athletics, specific event or contest. Moreover it is generally agreed among coaches
and exercise physiologist, that every individual does not respond to training in the same manner. There are certain anatomical (trunk, shoulder, pelvis, chest, abdomen, upper and lower extremities) and physiological (blood volume, blood pressure, heart rate, cardiac output and vital capacity) differences. Sex difference which favors both male and female for specific activities. Coaches and physical education teacher should also have an idea of factors that influence in the pre adolescent and adolescent period during the training. Most recently two training models are combined in one session to increase the sports performance.

1.8 VOLLEYBAL

It is an Olympic sport invented by a physical Director Springfield College of the YMCA name William G.Morgam. Volleyball is a sport played by two teams consisting of 12 players each on a playing court, divided by a net. The object of the game is to send the ball over the net in order to ground it on the opponent’s court and to prevent the same effort by the opponent. The team has three hits or contacts to return the ball. To play volleyball one has to be good at vertical jump, and reaction ability. A volleyball match can be played for five sets which means a match can last for about 90 minutes,during which a player can perform 250 -300 actions dominated by the explosive type of strength of the leg muscles. The total number of actions such as jumps takes up around 50-60% high speed movements and change of direction in space about 30% and as falls about 15%. The spike and block actions are dominated by the corresponding explosive
type of strength which is referred to as a player’s vertical jump which is usually the key to winning point (T.Stojanovic, Radmila Kostic 2004). It is important to consider that spikes and blocks are not only jumps, but jump-landing sequences. In particular, the landing phase requires dissipation of the kinetic energy generated during the jump. Newton mechanics dictates that increases in jump height (most prevalent in elite volleyball players) must be accompanied by a proportional increase in the kinetic energy that must be properly absorbed to avoid injury (Dufek and Zhang, 1996). These landings often result in the creation of ground reaction forces on the order of five times body weight (Adrian and Laughlin, 1983). The deleterious effects of these forces may be compounded when considering that a front-row player may jump and land many times during a regulation match. So there are chances to get injured in the knee, ankle, and shoulder joints during these game situations.

1.9 INJURIES

“Sports injuries” are injuries that happen while playing sports or exercising. Some are from accidents; others can result from poor training practices or improper gear. Some people get injured when they are not in proper condition. Not warming up or stretching enough before you play or exercise can also lead to injuries. The most common sports injuries are: sprains and strains, knee injuries, swollen muscles, achilles tendon injuries, pain along the shin bone, fractures, and dislocations.
There are two kinds of sports injuries: acute and chronic. Acute injuries occur suddenly when playing or exercising. Sprained ankles, strained backs, and fractured hands are acute injuries. Signs of an acute injury include: Sudden, severe pain swelling, not being able to place weight on a leg, knee, ankle, or foot an arm, elbow, wrist, hand, or finger that is very tender not being able to move a joint as normal extreme leg or arm weakness, a bone or joint that is visibly out of place.

The other common sports related injuries are overuse and strain injuries, because of the over confidence of the athletes. An overuse injury results from excessive wear and tear on the body, particularly on areas and muscles subjected to repeated activity such as ankle, knee, shoulder and elbow joints. The other injuries are muscle pull, muscle cramp, shoulder injuries, head injury and ankle injuries and so on.

**1.10 SOFT TISSUE INJURIES**

While participating in sports and physical fitness activities, it is possible to get injury in the soft tissues. Even simple everyday activities can damage these ligaments, tendons, and muscles. Some of the soft-tissue injuries are most likely to experience include: sprains, strains, Contusions, tendinitis, bursitis, stress injuries. Any of these can be the result of a single episode, such as a fall, a sudden twist, or a blow to the body and might also sustain one or more of these injuries
because of repeated overuse, such as in ongoing athletic activities. The result can be damage and pain.

1.11 SPRAINS

The joints of our body are supported by ligaments. Ligaments are strong bands of connective tissue that connect one bone to another. A sprain is a simple stretch or tear of the ligaments. The areas of our body that are most vulnerable to sprains are our ankles, knees, and wrists. A sprained ankle can occur when our foot turns inward, it will put extreme pressure on the ligaments of our outer ankle and cause a sprain. A sprained knee can be the result of a sudden twist. A wrist sprain most often occurs when we fall on outstretched hand.

1.12 STRAINS

Bones are supported by a combination of muscles and tendons. Tendons connect muscles to bones. A strain is the result of an injury to either a muscle or a tendon, usually in foot or leg. The strain may be a simple stretch in our muscle or tendon, or it may be a partial or complete tear in the muscle-and-tendon combination. The recommended treatment for a strain is the same as for a sprain: rest, ice, compression, and elevation. This should be followed by simple exercises to relieve pain and restore mobility.
1.13 CONTUSIONS

A contusion is a bruise caused by a blow to muscle, tendon, or ligament. The bruise is caused when blood pools around the injury and discolors the skin. Most contusions are mild and respond well to rest, ice application and compression, and elevation of the injured area.

1.14 TENDONITIS

Inflammation is a healing response to an injury. It is usually accompanied by swelling, heat, redness, and pain. An inflammation in a tendon or in the covering of the tendon is called tendonitis. Tendonitis is caused by a series of small stresses that repeatedly aggravate the tendon. Professional baseball players, swimmers, tennis players, and golfers are susceptible to tendonitis in their shoulders and arms. Soccer and basketball players, runners, and aerobic dancers are prone to tendon inflammation in their legs and feet. Tendonitis may be treated by rest to eliminate stress, anti-inflammatory medication, steroid injections, splinting, and exercises to correct muscle imbalance and improve the condition of muscle.

Playing volleyball can result in two kinds of shoulder injuries: cumulative injuries, which occur from overuse of the joints and muscles, and acute injuries, which occurs due to sudden accidents, such as an impact with the floor or another player. Front-line players, who use their shoulders while spiking and blocking
balls at the net, are susceptible to cumulative injuries from overuse. Players who dive to the floor are at risk of acute shoulder injuries.

Rotator cuff tendinopathy occurs with overuse of the muscles that make up the rotator cuff: the infraspinatus, the teres minor and supraspinatus muscles, suprascapular neuropathy results from compression of the nerve that runs across the top of the shoulder. It is often caused by the sudden stop in the arm swing that occurs after hitting the ball in an overhead motion.

1.15 INJURY IN VOLLEYBALL

Volleyball has become an extremely popular participation sport worldwide. Fortunately, the incidence of serious injury is relatively low. The sport-specific activity most commonly associated with injury is blocking. Ankle sprains are the most common acute injury. Recurrent sprains may be less likely to occur if an ankle orthosis is worn. Patellar tendinitis represents the most common overuse injury, although shoulder tendinitis secondary to the overhead activities of spiking and serving is also commonly seen. An unusual shoulder injury involving the distal branch of the suprascapular nerve which innervates the infraspinatus muscle has been increasingly described in volleyball players in recent years. Hand injuries, usually occurring while blocking, are the next most common group of injuries. Fortunately, severe knee ligament injuries are rare in volleyball. However, anterior cruciate ligament injury is more likely to occur in
female players. Many of these injuries may be preventable with close attention to technique in sport-specific skills and some fairly simple preventive interventions.

1.16 BASKETBALL

Basketball is one of the most popular sports in the world. Millions of people participate in the sport at all levels of competition. There are five players on each team and each team tries to get the basketball in each other's nets. One can play this game with a basketball which is a sphere orange colored with black stripes. There are few ways to score. The first is to make a basket within the large that extends past the free throw line. Any shot in this range is worth 2 points. Any shot made outside of the large arc is worth 3 points. If fouled while shooting, it leads to the free throw line to earn back the points. Each free throw is worth one point. There are many rules to basketball, and some rules are added in each upcoming year. There are professional teams, college teams, high school, middle and even some elementary school teams. The main thing is to get the ball into the opposing team's hoop by dribbling and shooting with your hands.

1.17 INJURIES, IN BASKETBALL

Basketball is a physically demanding contact sport. Due to the repetitive and forceful nature of running, jumping twisting, and direct contact, the relation between injury and sport often parallel each other. Some of the most common basketball injuries involve the knee, ankle, and foot. These may include tears to
the meniscus, ACL sprains or tears, patellar tendonitis, ankle sprains, and metatarsal fractures in the foot. An ankle sprain is a common occurrence in basketball, even other sports also. It is due to stretch or tears to one or more of the ligaments in the ankle. It is graded on I to III grading scale on ligaments damage, and grade III is being the most severe injury.

Achilles tendinitis is another common overuse injury in basketball players. This injury of the tendon connecting the muscles in the back of the calf to the heel bone causes pain in the back of the leg just above the heel. Occasionally, the Achilles tendon can tear. Some basketball players overuse the tendons in their shoulders. The rotator cuff of the shoulder is composed of four muscles. The tendons that attach these muscles to the shoulder bones can become inflamed and painful, particularly on doing repetitive overhead activities, such as shooting the basketball.

Basketball requires extensive stop and go and cutting maneuvers which can put the ligaments and menisci of the knee at risk. Injury to the medial collateral ligament is most common following a blow to the outside of the knee.

Though there are different kinds of sports injuries, the researcher was interested study only the rotator cuff injury of the shoulder and soft tissue injuries of knee and ankle, which are commonly occurred during game situation.
1.18 TREATMENT

Sports injuries are injuries that occur most commonly during sports or exercise. They can be due to poor training, inadequate warm up, lack of conditioning, or trauma. There are many ways to treat the injuries. Short wave Diathermy, Ultra sound, wax bath and sauna bath are commonly used.

1.19 SHORT WAVE DIATHERMY:

Shortwave diathermy is a form of High frequency currents, which produces heat on tissues, helping in healing process. It is widely known that shortwave diathermy (SW) can be used to reduce pain and swelling, accelerates the inflammatory process, and promotes healing in tissues with chronic inflammation. Application of SW diathermy to the involved tissues may increase vascular circulation, including white blood cells and change tissue temperature, which directly results vascular dilatation, an increase in pain threshold, and a decrease in pain and swelling encourages resolution of the inflammatory processes by increasing nutrition and oxygen supply and by removing metabolic and waste products. This in turn promotes natural resistance to infection Owing to the chronic nature of the disease, large doses of analgesics and their side effects on the body, there is a need for a none invasive therapeutic and symptomatic chronic pain management.
Short wave diathermy is associated with the dilation of arterioles and capillaries which result in an increased flow of blood to the pelvic area, making available an increased supply of oxygen and nutritive materials and also bringing in more white blood cells. The dilation of capillaries also increases the exudation of fluid into the tissues and this is followed by increased absorption which together with the increased flow of blood through the pelvic area, assists in the removal of waste products. These effects help to bring about the resolution of inflammation. (Balogun, Okonofua -1998)

1.20 ULTRASOUND THERAPY

The definition of ultrasound is energy generated by sound waves of 20,000 or more vibrations per second. Ultrasound is used in a large array of imaging tools. Often used for medical diagnostics, ultrasound uses sound waves that are far above the frequency heard by the human ear. A transducer gives off the sound waves and reflected back from organs and tissues, allowing a picture of what are inside the body to be drawn on a screen. Ultrasound can be used to look for tumors, analyze bone structure, or examine the health of an unborn baby.

Two researchers are noted in the history of ultrasound and medical imaging. They are: Doctor Karl Theodore Dussik of Austria, who published the first paper on medical ultrasonics in 1942, based on his research on transmission ultrasound investigation of the brain; and Professor Ian Donald of Scotland, who
developed practical technology and applications for ultrasound in the 1950s. Ultrasound therapy is a treatment modality used by physical therapists or occupational therapists to treat pain conditions, and to promote tissue healing. While ultrasound therapy is not effective for all chronic pain conditions, it may help reduce your pain. (Erica Jacques -2010)

This therapy is often performed by a physical therapist as a pain treatment modality. Ultrasound therapy can be used in two ways: thermally, as a heat agent, and mechanically, as a vibration agent. A physical therapist may choose one or both ultrasound approaches, depending on your chronic pain condition. Thermal ultrasound is like a very deep heat: It penetrates the deep tissues, warming them up to encourage the healing of soft tissues. A physical therapist might use thermal ultrasound to treat a strained muscle that has not healed as expected.

Mechanical ultrasound causes tiny vibrations in the soft tissue, which can decrease swelling and inflammation in order to reduce some types of pain. It is, like thermal ultrasound, also promotes soft tissue healing. A physical therapist might use mechanical ultrasound to break up deep scar tissues in the muscles or ligaments.

The warming effect encourages healing in the soft tissues by increasing the metabolism at the level of the tissue cells. Mechanical ultrasound therapy uses pulses of sound waves to penetrate tissues. While this still has a minor warming
effect on the tissues, it also causes expansion and contraction in the tiny gas
bubbles of the soft tissues. This helps to decrease the inflammatory response,
reducing tissue swelling and thus decreasing pain.

1.21 WAX THERAPY

Wax therapy, which uses a bath of molten paraffin wax, is one of the most
effective ways of applying heat to improve mobility by heating connective tissues.
Wax therapy is mainly used on hands and is often used by hand therapists in a
hospital setting with an exercise programme. The aims of wax bath therapy are to
provide pain relief and comfort, to assist with muscle relaxation and to relieve
stiffness and help improve movement before exercise.

Paraffin wax bath therapy is safe, although one should take care with
home kits not to heat the wax too much as this could be dangerous. One shouldn’t
use wax bath therapy if there is cuts, open sores or inflammatory skin conditions.
Wax Bath Therapy is all about relieving pain, treating or preventing muscle injury
and deep cleansing your skin, all naturally and without drugs. Millions of nerves
endings send massive electrical signals to the brain, pinpointing the source of the
problem. Healing agents, called Endorphins are sent to the site, to restore the
natural state, and the pain diminishes. Access to this inner layer is gained via
thousands of tiny holes in the skin, which, in effect, make it absorbent or porous.
Gently raising the temperature of the skin, locally, around the affected area, and
warming the sub layer, triggers a gland in the base of the brain to release endorphins and send them to that local area.

The area around the source of the pain is encased in a warm glove or blanket of wax. Latent heat is transferred through the skin, warming the sub layer. The brain is ‘tricked’ to release Nature’s own healing endorphins and are thus encouraged to flow freely, relieving pain quickly and effectively. The open skin pores allow natural oils, applied to the area beforehand, to be absorbed. The oils dissipate slowly, prolonging the effect. As the wax cools, so the pores close from the inside, gently expelling any unwanted trapped matter.

1.2.2 MASSAGE

Massage involves acting on and manipulating the body with pressure – structured, unstructured, stationary, or moving – tension, motion, or vibration, done manually or with mechanical aids. Target tissues may include muscles, tendons, ligaments, fascia, skin, joints, or other connective tissue, as well as lymphatic vessels, or organs of the gastrointestinal system. Massage can be applied with the hands, fingers, elbows, knees, forearm, and feet. There are over eighty different recognized massage modalities. (The National Center for Complementary and Alternative Medicine (NCCAM). 2007)

Swedish massage is defined in large part by the original strokes that compose its method: effleurage (stroking), petrissage (kneading), tapotement
(striking), and frictions (rubbing), with vibration added later. The French terms - effleurage, petrissage, frictions (massage a’ frictions) and tapotement.

Massage is the manipulation of superficial and deeper layers of muscle and connective tissue to enhance function, aid in the healing process, and promote relaxation and well-being. The word comes from the French massage "friction of kneading", or from Arabic massa meaning "to touch, feel or handle" or from Latin massa meaning "mass, dough", cf. Greek verb μάσσω (massō) "to handle, touch, to work with the hands, to knead dough". In distinction the ancient Greek word for massage was anatripsis, and the Latin was friction.

Massage therapy improves circulation and there by bring oxygen and other nutrients to body tissues. It relieves muscle tension and pain, increases flexibility and mobility, and helps clear lactic acid and other waste, which reduces pain and stiffness in muscles and joints. People get massage therapy for relaxation or for a variety of health conditions such as back pain, inflammatory conditions such as arthritis and tendonitis. Stress relief and stress-related conditions, Headaches and migraines, Muscle and related conditions such as spasms, strains and sprains, and Post-injury and post surgical rehabilitation.
1.23 REASON FOR THE SELECTION OF THE TOPIC

Game of Basketball and Volleyball skills involved in jumping, landing after jump ball handling, fast movements, which resulted knee injuries, ankle injuries and shoulder injuries. These sports injuries are broadly classified into mild injuries and serious injuries and under mild injuries soft tissue injuries and skin injuries are very common among sportspersons. Since the game, volleyball and basketball involves speed of movements, jumping and ball shooting soft tissue injuries of ankle, knee and shoulder are very common. The investigator closely associated with state level volleyball players frequently come across players suffering in these sports injuries. Though different treatments for the injuries are the researcher interested to study only the effect of S.W.D, US, M & WT treatments and compare its merits. It was also observed this situation even make the players were affected due to the injuries and were unable to participate in the prestigious competitions. Missing the chance of playing, this causes severe stress among the players. More over the treatment for the injury and recovery take more than a month’, by the time the performance level will come down drastically. There is different physiotherapy methods are being used to treat the soft tissue injuries of the players. They are ultrasound therapy, wax bath and massage, apart from electrotherapy such as short wave diathermy, Transcutaneous electrical stimulation (TENS), galvanic stimulation (GS), Percutaneous electrical stimulation (PENS), Neuromuscular electrical stimulation (NMES), Interferential
current therapy (IC), Microcurrent therapy, Electro-acupuncture (EA), spinal cord stimulation (SCS), Transcutaneous spinal electroanalgesia (TSE). To facilitate speed recovery from the injury, it is much essential to select the right treatment. In this research the researcher are interested to find out effect of short wave diathermy (one of the electrotherapy methods), ultrasound therapy, and a therapy using wax bath and massage, a therapy used through wax followed by massage on selected soft tissue injuries of ankle, knee and shoulder. Even though there are different ankle injuries, the investigator selected ankle sprain. And among the knee injuries, selected anterior cruciate ligament (ACL) injuries and among the shoulder injuries selected shoulder rotator cuff tear for this study. To test the therapeutical effect of these different treatments on the injured players, the researcher selected three distinct variables, namely, perceived pain, swelling and range of motion.

1.24 STATEMENT OF THE PROBLEM

The purpose of this study was to trace out the effect of short wave diathermy, ultrasound therapy and wax bath and massage therapy on soft tissue injuries of shoulder, knee and ankle joints among elite volleyball and basketball players.
1.25 HYPOTHESES

Among the many types of sports injuries, soft tissue injuries involving, shoulder, knee and ankle joints are very common among volleyball and basketball players, as these players have to involve in speed movements, which normally affects the knee and ankle of these players and ball handling and shooting, which normally affects the shoulders of the players. Different types of physiotherapy methods are being given to treat the soft tissue injuries of shoulder, knee and ankle joints. In the light of the theoretical foundations laid so far on the treatment effects, the investigator hypothesized the following for the purpose of this study.

1. It was hypothesized that short wave diathermy treatment would significantly reduce swelling, perceived pain and improve range of motion of rotator cuff tear, anterior cruciate ligament and ankle sprain of basketball and volleyball players.

2. It was hypothesized that ultrasound therapy treatment would significantly reduce swelling, perceived pain and improve range of motion of rotator cuff tear, anterior cruciate ligament and ankle sprain of basketball and volleyball players.

3. It was hypothesized that wax bath and massage treatment would significantly reduce swelling, perceived pain and improve range of motion of rotator cuff tear, anterior cruciate ligament and ankle sprain of basketball and volleyball players.
4. It was hypothesized that there would significant difference in reducing swelling of rotator cuff tear, anterior cruciate ligament, ankle sprain injuries among the experimental treatments, namely, short wave diathermy, ultrasound therapy and wax bath and massage.

5. It was hypothesized that there would significant difference in reducing perceived pain of rotator cuff tear, anterior cruciate ligament, ankle sprain injuries by experimental treatments, namely, short wave diathermy, ultrasound therapy and wax bath and massage.

6. It was hypothesized that there would significant difference in improving range of motion of rotator cuff tear, anterior cruciate ligament, and ankle sprain injuries by experimental treatments, namely, short wave diathermy, ultrasound therapy and wax bath and massage.

1.26 SIGNIFICANCE OF THE STUDY:

A Soft tissue injury (STI) is the damage of muscles, ligaments and tendons throughout the body. Common soft tissue injuries usually occur from a sprain, strain, a one off blow resulting in a contusion or overuse of a particular part of the body. Soft tissue injuries can result in pain, swelling, bruising and loss of function (Lovering, 2008). Soft tissue injuries of the knee is one of the clinically challenging musculoskeletal disorder most commonly prevalent, Statistics revealed that, there were more than 1 million emergency department
visits and 1.9 million primary care outpatient visits are for acute knee pain in general. Therefore, establishing clear-cut diagnostic and therapeutic objectives for these injuries is important. In view of these statements, the following are found to be the significance of the study.

1. The findings of this study would be helpful to assess the present status of the elite volleyball and basketball players injured of soft tissue injuries of shoulder, knee and ankle.

2. The findings of this study would be helpful to find out which of the different physiotherapy method is more helpful in treating such soft tissue injuries of shoulder, knee and ankle joints.

3. The study would throw light on the importance of treating shoulder, knee and ankle joint injuries in time.

4. The findings of this study would be helpful in finding out which of the selected variables, namely, perceived pain, swelling and range of motion is significantly influenced by selected physiotherapy methods.

5. The findings of this study would be helpful to sports administrators, sports medicine doctors, and physiotherapists to adopt the most effective physiotherapy method for the treatment of selected injuries.
6. The findings of this study would be helpful to further researches in this area.

1.27 DELIMITATIONS:

The study was delimited to the following aspects.

1. The study was delimited to male volleyball and basketball soft tissue injured players in the age group of 21 to 28 years.

2. Among the soft tissue injured players, the investigator randomly selected 10 rotator cuff tear injured; 10 anterior cruciate ligament injured and 10 ankle sprained, consisting volleyball players and basketball players.

3. Each of the 10 injured players of volleyball and basketball were randomly selected into three groups, namely, short wave diathermy treatment group, ultrasound therapy treatment group and wax bath and massage treatment group consisting of 12 injured players in each.

4. The treatment for the soft tissue injuries were confined to fifteen days only.
5. The dependent and independent variables selected for this study are as follows:

**Dependent Variables**

1. Perceived Pain of rotator cuff tear, anterior cruciate ligament and ankle sprain injuries

2. Swelling of rotator cuff tear, anterior cruciate ligament and ankle sprain injuries

3. Range of Motion of rotator cuff tear, anterior cruciate ligament and ankle sprain injuries

**Independent Variables**

1. Short wave diathermy Treatment (SWDT)

2. Ultrasound therapy Treatment (UTT)

3. Wax Bath and Massage Treatment (WBMT).

1.28 LIMITATIONS

1. Certain other soft tissue injuries of shoulder, knee and ankle joint injuries were not considered for this study.
2. Certain factors such as life style, rest period, day to day activities, family factors and food habits were not taken in to consideration.

3. Socio-economic background was not taken into consideration.

4. No attempt was taken to control the factors such as air resistance, intensity of light, atmosphere and temperature during the training period.
1.29 DEFINITION OF THE TERMS:

1.29.1 Sports injuries

Sports injuries result from acute trauma or repetitive stress associated with athletic activities. Sports injuries can affect bones or soft tissue (ligaments, muscles, tendons). (Medical dictionary 2010)

1.29.2 Soft Tissue Injuries

P.M.Tidus defined the term soft tissue injury as the injuries to muscles, ligaments and tendons. It excludes fractures but also more severe injuries such as significant hemorrhage, crush syndrome, head injuries or acute spinal cord compression. Soft tissue can result in pain, swelling, bruising and loss of function (Lovering 2008), physical therapy and related intervention.

1.29.3 Shoulder Injuries

The shoulder includes the proximal humerus, the clavicle and the scapula, and their connections to each other, to the sternum (clavicle), and to the thoracic rib cage (scapula) and injuries affecting these parts of the body are defined as shoulder injuries.
1.29.4 Rotator cuffs tear injury:

A rotator cuff tear injury includes any type of irritation or damage to your rotator cuff muscles or tendons. Causes of a rotator cuff injury may include falling, lifting and repetitive arm activities - especially those done overhead, such as throwing a baseball or placing items on overhead shelves (Mayoclinic.com)

1.29.5 Knee Injury

The five most common knee problems are arthritis, tendonitis, bruises, cartilage tears, and damaged ligaments. Knee injuries can be caused by accidents, impact, sudden or awkward movements, and gradual wear and tear of the knee joint. (Medical dictionary 2010)

1.29.6 Anterior Cruciate Ligament Injury

An anterior cruciate ligament injury is the over-stretching or tearing of the anterior cruciate ligament (ACL) in the knee. A tear may be partial or complete.(Medical Reference: Encyclopedia)

1.29.7 Ankle Injuries

The most common injury to the ankle is damage to the ATF ligament with or without involvement of the peroneus brevis. The subtaloid and mid-tarsal joints may be involved but will be dealt with separately for clarity.
1.29.8 Ankle Sprain

A common musculoskeletal injury in which the ligaments of the ankle partially or completely tear due to sudden stretching.

1.29.10 Short wave diathermy

Short waved diathermy is the therapeutic elevation of temperature in the tissue by means of an oscillating electric current

1.29.11 Ultrasound therapy

Therapeutic ultrasound in physical therapy is alternating compression and rarefaction of sound waves with a frequency of >20,000 cycles/second.

1.29.12 Wax Bath

The affected part is immersed into the wax then that part is surrounded by the melted wax (Mixture of wax and paraffin), is called as wax bath.

1.29.13 Massage

Massage is a therapeutic manipulation of the soft tissues of the body with the goal of achieving normalization of those tissues (Batt ME, et.al. 1996).
1.29.14 Perceived Pain

An unpleasant sensation occurring in varying degrees of severity as a consequence of injury, disease, or emotional disorder. Thus, perceived pain in the perception of pain due to physical suffering associated with a bodily disorder (such as a disease or injury) and accompanied by mental or emotional distress (Lynn B, 1984) Pain is different as oar bump/Easton sensory and emotional experience that is associated with actual or tissue danger Merskey H, and Able-Fessard, DG Pain terms: A list with definitions and notes an usage pain 6.249 1976.

1.29.15 Swelling

An abnormal enlargement of a part of the body, typically as a result of an accumulation of fluid. (Merriam Webster – The Free Dictionary)

1.29.16 Range of Motion

The range through which a joint can be moved, Cynthia Norkins