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Sports Medicine: Meaning, Definition, Aims, Objectives, Modern Concepts and Importance

MEANING OF SPORTS MEDICINE

Sports medicine is concerned with the care and potential performance of the players. It requires a comprehensive approach. Credit of establishing principles of care was given to Herodicus of Selymbria at the time of Socrates and Claudius Galen in 131 AD. They emphasized training, diet, massage and a medical approach to athletics. Galen's contribution to scientific medicine as monumental. He placed the clinical instructions of Hippocrates on a sound experimental basis, for fifteen hundred years, his works dominated medical knowledge. He was a true sports medicine practitioner, because of which sometimes he is called as father of sports medicine. Today, sports medicine has evolved into a respected discipline with dedicated associations, colleges, institute and literature in most countries.

Causes led to Development of Sports Medicine

Modern man seems obsessed by sports, both as spectator and participant. Around twenty five to thirty per cent of human beings all around the world regularly compete in sports activities. This is not surprising. The health benefits of regular exercises are well documented by decrease in coronary artery diseases, high blood pressures and non-insulin dependent diabetes, and all responsible medical practitioners promote it as the easiest way to preserve health.

There is concern that till now, human beings throughout the world are not taking part in physical activities to satisfactory level. In developing countries, people's lack of exercise, together with tobacco and alcohol

consumption, seems likely to create a health catastrophe in the near future.

In ancient times, various kinds of sporting events were being organised by kings and emperors with the purpose of entertaining general public. Baron Pierre de Coubertin, who is regarded as father of modern Olympics said that the Olympic movement tends to bring together in a radiant union of all the qualities, which guide mankind to perfection. This statement appears to be idealistic, it is not unreasonable to want to use sport activities to improve the human lot and make it more bearable for all.

Evolution of Organised Sporting Activities

Organised sporting activities or competitions can be shown to have three major milestones :—

i. Ancient Calender with Egyptian, Chinese, Indian and Islamic events.

ii. Olympic Games, the Greco-Roman tradition with the Ancient Games and the Modern Games. Olympic competition introduced idealism dedicated to the glory of Zeus, the mind, body and spirit of man with a celebration of the mind and body and the need to rise above politics. Sport functioned to elevate man to a plane of idealistic behaviour above their biological needs.

iii. Great English Public Schools recognised the civilizing influence of organised sports. It served to subvert the energies of their school pupils into enterprises of co-operation and heroism on the football field and the water rowing. The same schoolboys went upto the University and out to the colonies. All schools and universities eventually established athletic events as an important part of their curriculum.

Today sporting events have recognised a lot of consideration. Not only this, sport will play a crucial part in out future also. The scientific endeavours of this century have been directed at military conquest, wealth accumulation and medicine. All researches has led to biomedical advances. Field of sports medicine will showcase the achievements of medical science. The health problems of the world are currently respiratory infections, diarrhoea, depression and heart diseases. The risk factors

for these problems are no food, no water, no sanitation, no exercise, no safe sex, too much tobacco use and high blood pressure.

It has been predicted by the experts that in the near future, main health problems will be heart disease, depression, road accidents and lung diseases, all of which will be attributable to occupation, alcohol and tobacco use. Many of these problems can be related to destruction of our environment in important way.

Today, there are basically two classes of countries, namely developed and the developing. Developed countries are characterized by wealthy western-styled democracies existing on national debts, while developing countries have widening wealth gap and dependent on world bank. The citizens of these countries fall into four groups, namely :—

a. cannot stop, which includes super achievers,

b. can cope, which includes solid citizens, who uphold the system and pay tax,

c. wound not cope, which consist of criminal groups and

d. cannot cope, which consist of mentally and physically handicapped persons, who need help.

Among these groups, persons belonging to cannot stop will plan while persons belonging to group can cope will carry out an answer to these problems.

It has become paramount important for human beings to protect their environment otherwise our children will be playing sport in a planetary junk yard. Sport activities may help us. It can modify various risks factors by allowing and encouraging us to reduce alcohol and tobacco use and to avoid physical inactivity. The benefits of sports activities may be taken further to protect the environment. If the purpose of sports activities is to enhance our health, then it is irrational and dangerous to exercise in a polluted environment, as environment is the main determinants of our health including food, water and clean air.

Urban players are found to inhale above average levels of air pollutants which bypasses the nose filter with an

open mouth. These pollutants are either a reducing or oxidant form of smog. The reducing forms, namely carbon fuels, consist of smoke particulate, sulfur dio- or trioxide, and may cause bronchospasm with respiratory infection, viral myocarditis, especially in children in big cities. The oxidant forms are carbon monoxide, which can be lethal in the elderly and possible the young players in competition, swimming times are slower when levels exceed thirty parts per mission, hydrocarbons, ozone and nitrogen oxides.

Various skaters have developed chemical pneumonitis from the nitrogen oxides given off by propane fuel-propelled resurfacing machines. Swimmers can have exposure dependent chloroform blood levels. Team doctors have been needed to monitor and advise on levels. It is necessary to organise or stage athletic events in those cities and countries which have a commitment to safe and clean environment. The culture of sport may need to develop a new creed, namely, Protect my Body and My Environment. There should be an awareness of the need of ecological compatibility of athletic performance with the environment in which the event is being held.

So that the sporting events can be organised to serve greater human needs, it is necessary to use sports medicine to showcase the advancements of medical science. World records should be broken by improved training techniques, tactics, equipment and nutrition. To avoid the adverse effects of pollutants on performance, athletic machine should be trained in environmental cocoons. Peripheral brains should be implanted to alter personality and psychological barriers and to enhance neuromuscular and cardio-respiratory performance. Design engineers should be given the task of improving sporting equipments and facilities, with which the players will be able to perform better and possibilities of their getting injured will lower down considerably.

In reality, our philosophical acceptance of these things will depend on whether we consider that such ventures improve the human lot or not. Today, sports medicine has attained an important and recognizable place in world

and is facing a new millennium with great expectations and is being on an ambitious scientific foundation.

Concept of Sports Medicine

Experts have divided medicine into various specialists, which is done on basis of area of body involved or according to patient's age. For instance, specialists of eye diseases are known as ophthalmology, specialists of diseases relating to ear, nose and throat are called ENT etc. Specialties concerned with different age groups include paediatrics, dealing with children and their complaints, and geriatrics, dealing solely with conditions affecting the elder persons. This kind of categorisation can be done to further extent, namely, in operative and non-operative specialties. Surgery of all kinds is an operative specialty, and even surgery can be divided into sub-specialties, depending on the organ involved, namely, neurosurgery, plastic surgery, cardiac surgery etc. There are also pure service disciplines within medicine, namely, anaesthetics, clinical neurophysiology, clinical chemistry etc.

With the development of medical science, there is tendency toward smaller subdivisions within each specialty. Surgery is a good example, sub-specialization into the surgery of different organs and tissues has reached such a stage that little is left to the general surgeon, other than the stomach and the abdomen. However, the human beings should never be regarded merely as a collection of organs, but as a complete entity, a multiplicity of different functions.

There are various illnesses or injuries which affect whole individual and consequently require the expert care of more than one specialist. For this reason, the traditional division of medicine into different specialists can be questioned, and it is possible that another system may evolve.

Sports medicine is not a medical specialty in the true sense of the word, instead, sports medicine concerns all those medical problems that may affect the athletes, professional and amateur. As a result, sports medicine is involved to a greater or lesser degree with all the

different medical specialties. It can be said that in essence, sports medicine is a trans-disciplinary speciality. In various countries of the world, and specially in developed countries, sports medicine is a specialty in its own right, and formal education is given in the subject. In many countries, there is no such commitment to sports medicine, although question of introducing sports medicine instruction for medical students or at different stages during the post-graduate training of junior doctors, has been raised in some countries, which will probably the case in near future.

There are three main areas found in sports medicine, which are : Traumatology, Medicine in True Sense and Physiology. Among of these, Traumatology is the discipline of injuries while Physiology is study of body's function. Sports medicine covers other important areas as well, such as sociology and psychology, behavioural science and a whole range of paramedical specialists. In addition, it is being linked to other branches of science.

Talking about sports injuries, they fall into two categories, namely, acute and over-use injuries. Injuries fallen in acute category are also called as traumatic. Traumatic injuries resemble to a lot of extent with those resulting from road traffic accidents or accidents at work. The differences lies in the fact that patients with sports injuries are often quite young, strong individuals, who frequently sustain their injuries during extremes of movement, when great muscular power and very rapid movements are used. Consequently, injuries sustained in sports are more extensive and more severe than general injuries, however, because sports injuries occur in young and healthy individuals, who have good healing potential, the injuries usually repair, if treated properly, with full restoration of normal function in the injured part of the body.

The difference found between sports traumatology and general traumatology is that an athlete requires not only to recover sufficiently from his injury to return to work, but he also requires to be sufficiently rehabilitated to resume his sporting activities at maximum capacity.

Athlete's demands for rehabilitation and medical attention are greater than those made by the non-sporting general public.

Thus, sports traumatologists have been under pressure to continue developing a number of areas that will provide improved and more refined diagnoses, better, safe and more effective operative techniques, and quicker and more effective rehabilitation. This is the main reason that why sports traumatology has contributed to so much new knowledge and expertise to classical orthopaedics and traumatology.

By analysing injuries occurring during sport and factors that predispose towards them, some sports traumatology has also introduced preventive measures. One such important measure is to provide athletes with adequate protective measures. This aspect has been dealt at length in another chapter, because of which is not discussed again. Another important aspect of traumatology deals with injuries caused by overload of different parts of the body, which are called as over-use injuries, which may result either from excessive loading at a normal frequency in movement or from increased frequency in movement with a normal load. In the worst cases, injury may result from both excessive load and frequency. Over-use injuries may also occur through excessively rapid movements, even at low loads, and this is an important factor. These injuries may also affect people who do not participate in active sports, but who expose themselves to similar risk factors.

An important feature of over-use injuries is that doctors frequently misinterpret the physical findings, make incorrect diagnoses, and institute inappropriate therapy. The study of sports injuries has provided information about the load which can be tolerated by man under different stress conditions. Not only this, a great deal about factors that promote healing in such disorders has been known, as well as possible ways of preventive or avoiding injury.

Thus it can be said that sports medicine has advanced the knowledge of traditional orthopaedics and

traumatology in field of sports injuries. The medical division of sports medicine covers those illnesses relevant to the practice of sport. A player is just as like as anyone else to be affected by, for instance, with an infectious disease. Such diseases, although not usually caused by involvement in sport itself, can be exacerbated by participation in sport. A condition that may not prevent the individual from doing normal work may be totally incapacitating in terms of sporting activity. However, it is important to recognise the demands that different types of sports place on the individual, in order to determine whether the symptoms of a disease warrant abstinence from sport.

In fact, sports training is incorporated in the rehabilitated programmes for many disorders. For instance, physical exercise is extremely important in diabetes, obesity, rheumatic disorders and cardiovascular disorders, vascular spasms in the legs, high blood pressure, and angina pectoris. In asthma and psychiatric illnesses, sport has proved to be beneficial and to have a significant influence on the individual's adjustment to a normal life-style.

In order to advise the person what sporting activity is appropriate for his specific complain, it is important to recognise that stresses and problems imposed by different sporting activities on the individual. The third major component of sports medicine is sports physiology, which is the knowledge of how to train hard effectively. Sports physiology was the first area of sports medicine to gain recognition. Knowing how different organs can be improved functionally when stressed is extremely valuable for sport, and it is this knowledge which forms the foundation on which improved training methods are based.

Sports physiology has contributed significantly to knowledge about fitness, stamina, strength and the structure and function of muscles. It is certainly an expanding and intensively researched field, and in the future, will no doubt significantly influence sports medicine. The major contribution of sports medicine is

probably the understanding of how the healthy human being functions, which has particular significance for the elite athletes.

It is important to mention here that sports medicine is not exclusively for top-class or for experienced athletes. When one considers the membership of sports associations throughout the world, it is obvious that sports medicine must concern the great majority of people participating in sport. In the media, doctors specializing in sports medicine are frequently portrayed as physicians who deal exclusively with injuries and illness in top class athletes, but this is not the case. The same medical problems occur in the average athlete or individual engaging in recreational sports activities.

Actually, concept of sports medicine is multi-disciplinary and it would be extremely difficult for any one individual to master all the different specialties in sports medicine. In the future, physicians and other personnel involved in sports medicine will be required to sub-specialise within the discipline. It will thus be of paramount importance for everyone involved to co-operate with those in other specialties, establishing a team effort, based on the needs of the athlete. As a consequence of lack of mandatory education in sports medicine in many countries, interested doctors, nurses and coaches come together to form sports medicine societies. In the future, it is likely that sports medicine will be acknowledged as a true medical specialty. The areas which are being covered by this discipline will be clearly defined and resources will be found for both active medical procedures and above all for preventive measures. It is essential in this context that resources should be made available both for routine clinical work and for research.

Prerequisites to Practice Sports Medicine

There are certain qualities which one should possess who wants to practice sports medicine, some of which are as follows :—

a. A good medical background, including instruction not only in the field of sports medicine, but also in associated specialties.

b. A thorough understanding of different sporting activities so that the person can appreciate the risks and problems that may arise in the various areas of sport.

c. It is essential to appreciate what it means to an athlete to be sick or injured and why a rapid and total rehabilitation is imperative.

DEFINITIONS OF SPORTS MEDICINE

- A field of medicine concerned with the prevention and treatment of injuries and disorders that are related to participation in sports
- The branch of medicine that deals with injuries or illnesses resulting from participation in sports and athletic activities.
- A field of medicine concerned with the functioning of the human body during physical activity and with the prevention and treatment of athletic injuries.
- Sports medicine is the branch of medicine concerned with the treatment of injuries or illness resulting from athletic activities.
- A field of medicine that uses a holistic, comprehensive, and multi-disciplinary approach to health care for those patients engaged in a sporting or recreational activity.
- The branch of medicine that deals with injuries or illnesses resulting from participation in sports and athletic activities.
- A branch of medicine that specializes in the prevention and treatment of injuries resulting from training for and participation in athletic events. More than 1 million people are treated for sports injuries each year in the United States. Most sports injuries involve muscle sprains, strains, and tears, which frequently result from inadequate preliminary "warm-up" exercises. Among the most common sports injuries are shin splints, runner's knee, pulled hamstring muscles, Achilles tendonitis, ankle sprain, arch sprain, charley horse, tennis elbow, baseball finger, dislocations, muscle cramps, bursitis, myofascitis, costochondritis, hernia, and "Little League elbow."
- A health subspecialty usually practiced by orthopedic surgeons or by rehabilitation medicine

physicians, involved in care of those who spring, sprint, splash, smash, whack, whoosh, bang, bash, bat, bounce, bogey or bop, for play or pay.

- A field of medicine that uses a holistic, comprehensive, and multi-disciplinary approach to health care for those engaged in a sporting or recreational activity.
- The branch of medicine concerned with the physiology of exercise and its application to the improvement of athletic performance and fitness, and with the prevention, diagnosis and treatment of medical conditions caused by, or related to, sporting activities of all kinds.
- Field of medicine that uses a holistic, comprehensive, and multi-disciplinary approach to health care for patients engaged in a sporting or recreational activity.
- A branch of medicine that specializes in the prevention and treatment of injuries from training and participation in athletic activities.

AIMS AND OBJECTIVES OF SPORTS MEDICINE

Sports medicine, also known as sport and exercise medicine (SEM), is a branch of medicine that deals with physical fitness and the treatment and prevention of injuries related to sports and exercise. Although most sports teams have employed team physicians for many years, it is only since the late 20th century that sports medicine has emerged as a distinct field of health care.

Sports medicine has been defined as a discipline which includes theoretical and practical branches of the relevant basic sciences and medicine which investigate, document and measure the influence of life-style, exercise, training and sport—or lack of these—on people in order to produce useful results for the prevention of disease or injury, treatment, rehabilitation and improvement in and society at large.

In the years since the first edition there has been increasing interest in the concept and speciality of sports medicine not as an intensely practical 'on the field' speciality which involves the use of core skills, advanced life support systems and the transport of the seriously

injured from the sporting venue to centres of secondary care.

In developing sports medicine close liaison with multi-disciplinary groups like sports science, coaching, physiology of training, Will be necessary. Parallel can be drawn with other branches of medicine where, for instance in orthopaedic surgery, prosthetic joints were developed from the collaborative efforts of different disciplines and strong associations are currently being developed between clinical sports medicine and the sports and exercise sciences.

The development of academic departments of sports medicine has yet to follow. However, many general practitioners are developing a special interest in the subject and the provision of sports medicine clinics through the UK has steadily increased over the last few years.

Training in Sports Medicine

Although there is no formal structure for training in sports medicine within the National Health Service, interested clinicians should acquire a sound knowledge of accident and emergency medicine. It is in this branch of hospital practice that most sports injuries will be seen.

In addition, knowledge of orthopaedics, exercise physiology and principles of physical training should be acquired. Probably the most important factor, however, is involvement with a sports team as its medical officer. This immediately confers responsibility for the care of athletes on the doctor and provides the stimulus to acquire knowledge on problems such as acclimatization, fitness testing, drug abuse and international travel. Physiological problems experienced by sportsmen or women can also be approached at first hand.

There are now several training courses open to doctors leading to diplomas or higher degrees. Possibly the most significant of them is the Diploma in Sports Medicine of the Royal Medical Colleges of Scotland. In an historic move in 1990 the three Royal College agreed that standards should be set for doctors practising sports medicine so that the public could recognize suitably qualified

practitioners.

The regulations and syllabus are as follows and there are three diets of the examination each year.

(i) The Board my refuse to admit to an examination or proceed with the examination of any candidate who infringes any of the regulations or is considered by the examiners to be guilty of behaviour prejudicial to the proper management and conduct of the examination.

(ii) Candidates for the Diploma in Sports Medicine must have been engaged in the study of their profession for not less than two years after obtaining full registration.

(iii) A candidate who passes the examination shall receive the Diploma in Sports Medicine of the Royal College of Physicians of Edinburgh, the Royal College of Surgeon of Edinburgh and the Royal Colleges of Physicians and Surgeons of Galsgow and shall receive a diploma bearing the seals of the said Royal Colleges.

(iv) Candidates for the Diploma in Sports Medicine must possess a qualification registered with the General Medical Council. Candidates from the European Community who are not registered with the GMC may also be admitted to the Examination by approval of the Board provided they have complied with all other requirements of the Regulations.

(v) Candidates are required to provide evidence of active participation in sports medicine. The examinations for the Diploma in Sports Medicine will normally be held three times each year unless otherwise stated. The dates of the examinations and fees payable for admission are available from the Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Glasgow.

The closing date for entry will be 6 weeks before the date of the examination. The dates of examinations and the fees payable for admission to the examinations for the Diploma of Sports Medicine are set out in the examinations calendar which is available from the Royal College of Physicians of Edinburgh, the Royal College of Surgeons of Edinburgh and the Royal College of Physicians and Surgeons of Glasgow.

(vi) The examination will be as follows:

(a) A theoretical paper of 1 hours;

(b) A multiple choice paper of 2 hours; duration;

(c) An oral examination of 20 minutes duration to cover the syllabus.

(d) A practical examination in three parts each of 20 minutes' duration as follows:

(i) Test of core skills

(ii) Clinical Examination.

(iii) Scenario tests to assess response and first aid;

MODERN CONCEPT OF SPORTS MEDICINE

Competition is inherent in all animals, including humans. We compete to dominate, we compete for survival. We compete for friends and mates. We compete for promotions in the work environment. And, of course, we compete on the playing surfaces in various athletic arenas.

You could say that competition is as much part of our life as life itself.

In ancient times, this need for competition led to friendly "combat" through sports. It became a generally safe way to release energy and satisfy our hunger to compete. But it wasn't always so. During the rise of the great Central and South American Indian empires, these competitions had their consequences; losing sometimes meant loss of one's life and a sacrifice to the gods. However, no mention of "friendly conflicts" was ever recorded until the rise of the Greek civilization. The advent of the Panhellenic Games (the most famous of these being the Olympic Games) was organized athletic as well as religious festivals. The events led to the production of coaches and trainers to aid athletes in achieving their optimal levels of success.

It was during this time in Athens the first professional athletes were born. The early athletic trainers, known as gymnastes, were men who had a base knowledge of diet, anatomy, and physiology to help keep these athletes in good condition. As this "art of sports medicine" developed, many of the athletic trainers and coaches of that time period were also physicians.

Perhaps the greatest of all the Greek trainers,

Herodicus, was a physician as well. Living in the 5th century B.C., his claim to fame was that he was the teacher of Hippocrates of Cos, the "father of modern medicine." Herodicus is given credit for being the "father of sports medicine" and the first physician to recommend exercise for the treatment of disease. Applying this concept, Asclepiades, a physician during the time of Christ, used massage and exercise for treatment of different ailments as well. "In ancient Rome during the 2nd century A.D., Galen served as court physician for Marcus Aurelius and later as the "team physician" at the gladiatorial school at Pergamum. He wrote numerous transcripts regarding the relationship between athletic performance and proper diet, rest, and abstinence from alcohol and sex. He noted how exercise led to improved physical conditioning. He was one of the first physician-philosophers and had a keen interest in the psychological make-up of certain individuals and their particular sport.

After the fall of the Roman Empire, interest in sports became nearly non-existent. It wasn't until the late 19th century with the establishment of both intercollegiate and interscholastic athletes in the United States that sports activities regained their popularity. With this renewed interest, the first modern day athletic trainers were born. Most had a crude knowledge of anatomy and physiology; their general purpose was to give massages, apply topical healing ointments, and instruct the athlete on some home remedies.

However, as the importance of sports progressed, athletic trainers evolved into a major influence in athletes' lives. Following WWI, the appearance of the athletic trainer became commonplace in intercollegiate athletics. One of the biggest influences in developing the athletic trainer into a capable and most importantly, credible, specialist in the sports medicine community resulted from the work of Dr. S.E. Bilik, a physician who in 1917 wrote the first major text on athletic training and the care of athletic injuries.

Contributions of Sports Medicine in Modern Era

Since ancient times Olympic athletes have had the services of trainers (paidotribes), and in many circumstances athlete relationships with physicians interested in sports (gymnastes), for example Galen, lacked mutual respect (Sarton 1954). Fortunately, this situation did not exist when the Olympic games were resumed centuries later.

As noted earlier, the United States had no official team physician until 1924; thus the medical care and treatment of the athlete was left to the trainer, spectator physician or nurse, or to chance. Because experience and availability were important pre-requisites for an appointment as a team physician, the care of the athlete and treatment of injuries by USOC-appointed specialists in cardiology, emergency medicine, family practice, obstetrics and gynecology, orthopedic surgery, and surgery are of recent vintage. The same conclusion apples to the Certified Athletic Trainer; hence the United States Olympic athlete in 1996 will have the services of an experienced and better prepared medical staff than was possible 100 years ago.

Although a complete medical examination is considered routine before participation in athletic competition, and especially before strenuous events, this has not always been the situation (Allman 1989). For example, because of the heat and humidity encountered at the 1904 and 1908 Olympic Games, the marathon had

a high "drop-out" rate. When a death occurred in the marathon at the 1912 Games, medical examinations became required for these long distance runners in 1920 (Ryan 1974). Subsequently, medical examinations became required for all contestants. However, medical examinations assumed a new meaning after 1946 when two "women" medal winners were discovered to be men. Visual examination for sex determination had an unpopular and short period before genotyping of sexual differences by buccal mucosa smear was initiated in 1968 (Ryan 1974). This procedure is no longer used, but genotyping continues based upon hair sample analysis.

In the past several decades, the most universal method to prevent pre-season and post-season athletic injuries is strength and power training. Although these programs are emphasized to increase muscle mass and to enhance performance, they can help reduce the magnitude of an injury and its duration (Kraemer and Baechle 1989). Requiring boxers and cyclists to wear helmets and having clinics for coaches on how to reduce athlete injuries are two additional examples of the progress made through the years.

IMPORTANCE OF SPORTS MEDICINE

Sport and exercise medicine doctors are specialist physicians who have completed medical school, appropriate residency training and then specialize further in sports medicine or 'sports and exercise medicine' (the preferred term). Specialization in sports medicine may be a doctor's first specialty. It may also be a sub-specialty or second specialisation following a specialisation such as physiatry or orthopedic surgery. The various approaches reflect the medical culture in different countries.

Specializing in the treatment of athletes and other physically active individuals, sports and exercise medicine physicians have extensive education in musculoskeletal medicine. SEM doctors treat injuries such as muscle, ligament, tendon and bone problems, but may also treat

chronic illnesses that can affect physical performance, such as asthma and diabetes. SEM doctors also advise on managing and preventing injuries.

Specialists in SEM diagnose and treat any medical conditions which regular exercisers or sports persons encounter. The majority of a SEM physicians' time is therefore spent treating musculoskeletal injuries, however other conditions include sports cardiology issues, unexplained under performance syndrome, exercise-induced asthma, screening for cardiac abnormalities and diabetes in sports. In addition team physicians working in elite sports often play a role in performance medicine, whereby an athletes' physiology is monitored, and aberrations corrected, in order to achieve peak physical performance.

SEM consultants also deliver clinical physical activity interventions, negating the burden of disease directly attributable to physical inactivity and the compelling evidence for the effectiveness of exercise in the primary, secondary and tertiary prevention of disease.

Exercise Medicine

The Foresight Report issued by the Government Office for Science, 17 October 2007, highlighted the unsustainable health and economic costs of a nation that continues to be largely sedentary. It forecasts that the incremental costs of this inactivity will be $10 billion per year by 2050 and the wider costs to society and businesses $49.9 billion. Physical inactivity inevitably leads to ill-health and it forecasts the cost of paying for this impact will be unsustainable in the future. No existing group of medical specialists is equipped with the skills and training to deal with this challenge.

The concept of Exercise as Health tool or Exercise is Medicine™ is becoming increasingly important. SEM physicians are able to evaluate medical patients co-morbidities, perform exercise testing and provide an exercise prescription, together with a motivational programme and exercise classes.

Public Health

SEM physicians are frequently involved in promoting

the therapeutic benefits of physical activity, exercise and sport for the individuals and communities. SEM Physicians in the UK spend a period of their training in public health, and advise public health physicians on matters relating to physical activity promotion. An example of published work includes the Royal College of Physicians publications.

Sports Medicine is a special division of Health Care Sector, which takes care of physical fitness and injuries associated with sports & exercise. Sports Medicine Companies provide effective treatments against the musculoskeletal issues. The concept of Sports Medicine is not very old. It began in the late 20s.

Which Professionals are in Sports Medicine Sector?

Sports Medicine Professionals have specialization in Exercise and Sports Science. The professionals in the field of Sports Medicine are designated as following:

- Medical Doctors
- Physical Therapists
- Physical Therapists Assistants
- Athletic Trainers
- Massage Therapists

The Role of Sports Medicine Physicians:

Sports Medicine Physicians are the experts who get specialized training for a certain period in the field of sports medicine. Their expertise lies in dealing with injuries associated with sports as well as exercises. They mainly focus on diagnosis and treatment of injuries, which take place during a sport or some physical activity. In brief, the Sports Medicine Physicians have to take care of different types of orthopedic cases.

What are the Sports Medicine Services Inclusive of?

Sports Medicine Services are intended to bring the injured person into the best of health so that he/she can get back to his or her usual activities. The Sports Medicine Services primarily focus on:

- Biomechanics
- Conditioning
- Synvisc
- Cortisone

REHABILITATION

According to WHO research and analysis more than 300 million people worldwide are disabled over 70 per cent of whom live in the developing countries. Only about 1% to 2% of disabled persons in the developing world have access to rehabilitation and the majority of them are relegated in the margins of society. Over the past decade, WHO has been promoting community-based rehabilitation as a way to increase access to rehabilitation and promoting equalization of opportunities for the social integration of disabled persons into the community and society. This approach employs resources within the family and community, along with support from the referral services. Rehabilitation has been defined as "the combined and coordinated use of medical, social, educational and vocational measures for training and retraining the individual to the highest possible level of functional ability".

Rehabilitation includes all measures aimed at

reducing the impact of disabling and handicapping conditions and at enabling the disabled and handicapped to achieve social integration. Social integration has been defined as the active participation of disabled and handicapped people in the main stream of community life.

Scope of Rehabilitation

Scope of rehabilitation is very vast which cannot be covered fully in the preview of the present study. However, some descriptions about this are given here. It involves disciplines such as physical medicine or physiotherapy, occupational therapy, speech therapy, audiology, psychology, education, social work, vocational guidance and placement services. The experts have identified the following areas of concern in rehabilitation:

(i) Vocational rehabilitation – restoration of the capacity to earn a livelihood.

(ii) Medical rehabilitation – restoration of function.

(iii) Psychological rehabilitation – restoration of personal dignity and confidence.

(iv) Social rehabilitation – restoration of family and social relationships.

Rehabilitation is no longer looked upon as an extracurricular activity of the physician. The current view is that responsibility of the doctor does not end when the 'temperature touches normal and stitches are removed'. The patient must be restored and retrained 'to live and work within the limits of this disability but to the hilt of his capacity'. As such medical rehabilitation should start very early in the process of medical treatment. Examples of rehabilitation are establishing schools for the blind, provision of aids for the crippled, reconstructive surgery in leprosy, muscle reeducation and graded exercises in neurological disorders like polio, change of profession for a more suitable one and modification of life in general in the case of tuberculosis, cardiac patients and others. The purpose of rehabilitation is to make productive people out of non productive people. It is now recognized that rehabilitation is a difficult and demanding task that seldom gives totally satisfactory results; but needs

enthusiastic cooperation from different segments of society as well as expertise, equipment and funds not readily available for this purpose even in affluent societies.

It is further recognized that interventions at earlier states are more feasible will yield results and are less demanding of scarce resources. In this direction the Rehabilitation Council of India (RCI) that is a statutory body under the RCI Act, 1992 came into force on 31st May, 1993 (Introduced later in this section and Govt. of India also enacted "The persons with Disabilities (Equal Opportunities, Protection of Rights and full Participation) Act, 1995. Many hospitals and other organizations (Govt. and Non Govt. Social) have a rehabilitation department/ institutions that work with disabled patients to help them return to normal life. There are two basic types of rehabilitation-therapy, physiotherapy and occupational therapy. Physiotherapy treats diseases or injuries. Occupational therapy helps overcome or reduce physical handicaps by teaching the patient various skills.

Even though an injury has been successfully treated and the athlete pronounced fit to return to his sport, some weakness in the damaged part may remain. The aim of treatment is to get one-hundred-percent complete recovery. This means a full range of movement and muscle control.

The joint must be as stable as it was before the injury: any residual weakness may result in a repetition of the accident and not necessarily under the same conditions.

For example, an ankle which has been damaged at football may, if not completely stable and rehabilitated, rick in a game of tennis or golf, in ski or even walking along the street. Or again, a collarbone broken in a riding accident may be associated with stiffness in the shoulder and neck muscles with limitation of movement, and these can be aggravated and give rise to painful symptoms in other sports like shooting, or any sport in which the shoulder and neck are used.

After the injury the muscles and soft tissues may become contracted and shortened and lose their resilience and elasticity. If this is not successfully counteracted,

the joints may also undergo deterioration, and eventually degeneration, leading later in life to osteo-arthritis—though this is a situation that the young sportsman may feel is too far off to worry about.

His successful return to his sport, however, is something that matters to him. Home treatment when done regularly and conscientiously after an accident can do more than prevent deterioration in the future. It can ensure that the sportsman goes back into his sport in perfect condition.

He should learn always to stand in the Active Alerted Posture as this not only distributes the body weight evenly over the joints, and especially the joint which is recovering, but also prepares it for action and helps prevent future injury.

Home treatment can be started, with the doctor's permission, even while the limb is in plaster of Paris or immobilised in some other way. Isometric exercises, elevation and hanging the limb can each be done for fifteen minutes daily, as can surging faradism if a faradic battery is available. Contrast baths can be used to bring extra blood-flow to the injured part. Products of injury are thereby carried away more rapidly.

Contrast bathing can be done in several ways, depending on the region of the injured part, beginning and ending with very hot water, as hot as it can be borne, and then alternating with ice-cold water. Two basins and tow sponges can be used or a hot and then a cold shower taken.

The sponge-and-basin method has the advantage that ice can be placed in the water. Two minutes of hot followed by two minutes of cold is the correct procedure. Always start and finish with hot.

Self-physiotherapy is a useful adjunct to the physiotherapy that may be given in the clinic or clinic or hospital. The recovering athlete can use talcum powder or a lubricating ointment, such as Vaseline or Nivea, and gently rub the injured part, learning to dig the fingers into the tender points. He may also have a heat lamp.

Exercises in the bath are easy to do and additions to

the water will help to give a special spa treatment. For instance, if coarse sea salt is added it gives the same effect as a dip in the ocean.

The salt is good for the skin, containing, as it does, all the minerals of the sea. A seaweed preparation can be added which also contains valuable sea minerals, especially iodine, a powerful disinfectant. Liquid seaweed added to hot water helps the body to get rid of impurities through additional sweating.

The bath is a good place to do some rehabilitating and general exercises.

1. For the Hip Joints, Pelvis and Lower Back

Resting against the back of the bath put the legs straight out in front of you. Rest one foot on the instep of the other. Press the top foot against the resistance of the lower foot. Reverse foot. Repeat five times.

2. For the Hips and Pelvis, and also to Strengthen the Lower Spine

Lean against the back of the bath with feet pressing against the tap end. Push the feet alternately against the bath end like a cat pressing its paws on a blanket. Do this twelve times.

3. For the Feet and Ankles

Sitting upright in the bath, feet at a right angle to the legs, turn toes in. Pull the foot up towards the insides of the ankles. Turn the toes out and pull up to the outside of the ankles. Do six times on each side and then repeat, but this curling the toes and keeping them curled as you pull up. The exercises can also be done in bed.

4. For the Lower Back

Sit upright in the bath, pull in the muscles of the abdomen slowly, starting at the pit of the stomach. Roll the muscles as if to tuck them under the ribs. Hold for a count of six and then very slowly relax. Repeat six times.

5. For the Shoulder Girdle

Sitting upright and with extended arms, clasp the hands in front. Keeping the arms straight, swing them overhead, then bend arms at the elbow, swing them over clasp the back of the head, elbows forward slowly. Relax and repeat five times.

Home Treatment and Exercise for the Neck

The cause of injury may be a fall in polo or any other equestrian sport; a motor racing or motor cycle racing accident could result in a break or dislocation or a whiplash injury, as could a head-on blow in rugby. A sudden whipping accident to the head in boxing may cause an injury.

A collar may have been prescribed while the injury was recovering. It is a good thing to continue to wear this at night or even intermittently during the day.

A woollen muffler worm while sleeping or an electric hot pad wrapped round the neck when first in beg may help relax the muscles.

Contrast baths and self-physiotherapy also strengthen weakened muscles and help to relieve tension.

The following exercises may be done at odd moments during the day, though six times for each one is enough at any session.

Neck Exercise (A)

Sitting upright, chin tucked in, back of the neck straight, bend the head very slowly forward to a count of six, then very slowly backward to a count of six, times each way.

Neck Exercise (B)

Still with fixed shoulders, rotate the head slowly clockwise then anticlockwise, ending the head over as far as possible.

Neck Exercise (C)

In the same position turn the head as far as possible to the left to a slow count of six, then slowly to the right, keeping the back of the neck straight. Do this six times each way.

Neck Exercise (D)

Sitting upright, chin tucked in, back of the neck straight, bend the head very slowly forward to a count of six, then very slowly backward to a count of six, six times each way.

Neck Exercise (E)

Grip the sides of the chair so as to fix the shoulders and then bend the head slowly to the left side, trying to

touch the shoulder with the ear. Do this to a slow count of six and similarly go over to the right. Do the double movement six times.

Swimming

This is one of the best possible rehabilitation exercise because it is non-weight-bearing. Even if the pool is small there are exercises that can be valuable because they are done against a natural resistance of the water. Swimming uses every muscle in the body.

Pool Exercise (A): for the Waist and Top Half of the Spin

Stand in water up to the neck with feet wide apart, arms outstretched, and tucked in. Twist at the waist, swinging the whole torso sideways, pressing slowly but firmly against the resistance the whole torso sideways, pressing slowly but firmly against the resistance of the water.

Swing slowly and purposefully round, pushing the resisting water away from you. Keep head still and eyes looking straight ahead, which gives extra resistance. Six times each side.

Pool Exercise (B): for the Feet

Run on the spot, raising knees as high as possible, this can be done at several depths for as long as you want.

Pool Exercise (C): for the Hips and Legs

Using a corner of the pool at the shallow end, rest your arms on the pool's ledge and support your weight on them–the water bears most of this burden. Spread your legs out behind you and swing the left leg over the right, then the right over the left in a scissors movement. Legs should be straight out at about waist height. Repeat six times.

Pool Exercise (D): for the Insides of the Thighs

Stand in the shallow end, holding on to the side of the pool. Allow the left leg to float slowly sideways to the surface until it is an near as possible at right niggles to the surface until it is an near as possible at right angles to the body.

Then press it down again hard, against the resistance

of the water. Repeat with the right leg. Do this exercise six times with each leg.

Pool Exercise (E): for the Feet

Rise on the tips of the toes ballet-style. Although this is not feasible on dry land, except, of course, for the ballet dancer, the water makes it easy by supporting the weight of the body. Walk on your "points, at neck depth, holding the body very straight and with the head held highly.

Pool Exercise (F) for the Knees and Hips

At a depth of three feet do a Russian sword dance, shooting feet vigorously out in front of you.

Underwater Massage

Rub, squeeze and knead the part that was injured and do those of the 'land' exercise that particularly apply to the injured part. Most of them can be adapted to water.

Home treatment and Exercise for Fingers, Hands and Wrists

Hands, wrists and fingers can be damaged at almost any sport. Fingers can receive a direct blow from a ball, be trodden on in football, snapped or dislocated when they take the brunt of a fall.

The complications which can occur with broken, sprained or dislocated fingers or thumbs are usually due to disturbed blood circulation: traumatic effusions of blood and lymph not being readily or fully absorbed. When this happens, adhesions and thickening result with stiffness and limitation of movement and chronic stiffness of joints and even, eventually, deformity.

Fractures, dislocations or subluxations of the wrist are more common than anywhere else in the body as one or other of these may happen if the hand is put down to avert a fall.

Until the condition is one-hundred-percent symptom-free contrast paths should be given twice daily to helps disperse the effusions. For a broken wrist without displacement a protective wrist gauntlet may be used fastened with Velcro for easy removal.

Sprains and Strain of the wrist occur in sports where a racquet, club or other tool is used incorrectly over a period without the wrist being properly fixed with the balanced action of the surrounding tendons.

The following wrist exercises are designed to put the joint through a full range of movement.

Finger Exercise (A)

Spread hands flat on a table top, spread fingers apart and bring them together again. Do this six times, both hands simultaneously.

Finger Exercise (B)

Palms flat on the table, lift all the fingers together, extending the tips backward six times.

Finger Exercise (C)

Hands together in front of you, palms and fingers together, fingers pointing upward as in prayer. Press the finger only over to the left keeping the palms upright and without giving way in the wrist. Press the fingers on the left hand backward with the fingers of the right. Do this twelve times and then reverse.

Finger Exercise (D)

In the same position, pull the palms away from the fingers, keeping the insides of the knuckles together, especially the little finger. The wrists should come up at right angles. Do this twelve times.

Finger Exercise (E)

Keeping fingers flat on the table top, lift the palms six times.

Finger Exercise (F)

Same position, then twist the palms upward and then downward, six times.

Finger Exercise (G)

'Play the piano' on the table, raising the fingers high.

Wrist Exercise (A)

Rest the forearm on a table with the wrist and hand extended over the edge, palms facing down. Bend the wrist down and up six times.

Wrist Exercise (B)

Same position but make a fist and rotate the wrist clockwise six times, then anti-clockwise six times.

Wrist Exercise (C)

Same position but swing the hands from side to side from the wrist six times.

Exercise (D)

Lying on the back, bringing one knee to the chest and circle it first clockwise, then anti-clockwise. Change legs and repeat, six times each side. Keep the back flat on the floor at the waist.

Exercise (E)

The second movement is carried out in the same position holding to the back of a chair. Standing on both feet, transfer all the weight to the left foot, raise the hip and the heel on the right side and put the leg diagonally back with the foot turned out, not pointed down. Raise the leg from the hip, and go on pulling the leg up in small further movements. Do this twelve times then change legs.

Exercise (F)

The third of this series is performed in the same position. Raise the hip and the heel on the right side and go back with the left, upright posture-twelve times each leg.

Home Treatment and Exercise for the Knee

The knee joint, thought it is surrounded by powerful muscles and strong ligaments, is, nevertheless, very vulnerable to both direct and indirect injuries. Torn ligaments are common in many sports; ligaments are there to stabilise the joint by preventing undue movement.

The severity of the injury often depends on how badly the ligaments are strained, torn or ruptured. Dislocations are uncommon although in some cases the patella—knee cap—dislocates.

Subluxations occur from lax ligaments and lead to joint instability.

After a knee injury, especially a dislocation or subluxation, the knee should be strapped with a stretch bandage, or an elastic half-stocking when a return to sport takes place.

Even after full movement has been restored, either by operative procedure or conservative treatment, and the athlete discharged from medical care, it may take a further tow or three weeks before strenuous exercise should be undertaken. During this period, home

treatment by the sportsman himself is important.

The aim is to avoid a recurring injury or weakness which could happen if the damaged structures were not returned to full and complete stability.

The home treatment exercise should be continued even after the return to sport to ensure that the muscles and ligaments are kept at their peak condition.

In order to test that the knee has full extension and full flexion, sit back on the heels. This should be easy and painless. If it is, do a further test. While sitting back on the heels put hands on the floor , fingers pointing away from the body and land back with straight back, head dropping backwards.

The main thing, before returning to full activity, is to get full power in the medial quadriceps muscles down the inner side of the thighs.

Exercise (A)

Sit upright on a couch with the legs supported and straight out in front of you, knees relaxed. Tighten the thigh muscles by pressing the knee down on the couch. Exercise both legs though only one has been injured. Dot this six times.

Exercise (B)

Lie flat on the floor on a blanket. Bring the feet up along the floor toward the chest, raise the legs in the air and do a bicycling movement with the legs, gently at first and then more vigorously if no pain is felt. Legs together, knees bent, feet on the floor, straighten legs.

Exercise (C)

With the injured knee braced, raise the leg upwards then swing it out and across to the other side, back and then down. Repeat the movement on the other side. Do each leg alternately, six times.

Exercise (D)

Sit on the edge of the couch with a cushion under the knees and the legs hanging down. Straighten the injured knee firmly. AT the same time bend the other knee, pulling the calf hard against the resistance of the coach. Slowly and deliberately change position so that the knee becomes straight, and vice versa. Do this six

times.

Home Treatment and exercise for the Feet and Ankles

Feet can suffer many direct injuries in a variety of sports. They can be hit by hard balls, mallets, hockey sticks and os on; they can be kicked by a horse and they can receive bruises or breakages from being stepped on by cleated shoes. Toes can be broken by stubbing; stress fractures can occur. Strains of the foot are common in many athletic activities.

The metatarsal bones at the base of the toes can be fractured by being heavily stepped on, and fallen arches are common to both metatarsal arch and longitudinal structures.

Ankles sprains are common to many sports. The ankle may rick over while running. Broken ankles occur in snow skiing but in deep, soft snow. A ruptured tendo-Achilles can also result from a similar fall.

Tennis and hurdling may produce tendo-Achilles injuries as well.

In rugby football a direct blow, or people falling over an extended leg in a pile-up, can cause fracture of the ankle bone. The tendo-Achilles' and its component muscles in the calf can best strained, torn or ruptured. Muscles can be torn from the shock strain of flat-footed so that the muscles, not being prepared, tear. This can happen in tennis, golf, cricket, volleyball, netball and similar sports.

Before and after returning to a sport following ankle injury, ankle strapping may be advisable. The heel or the arch may need to be raised with a rubber pad fitted into the shoe.

If there is any sign of swelling when activity again takes place, until the swelling has gone down. A group of exercises have been devised to put the joints through their full range of movement and strength all related muscles.

Toe Exercise (A)

In the same position, feet apart and parallel, knees apart and bent, bring the feet upwards and hold. Grip the balls of the feet with the toes and go on gripping to a

count of twelve.

Toe Exercise (B)

Stand upright, feet parallel and a few inches apart, raise straight toes off the ground as far as possible. Hold, then curl them under, balancing on the heel. You may hold on to back of a chair if necessary. Hold fora slow count of six.

Toe Exercise (C)

Rest the forefoot so that the base of the toes is resting against something hard, then the toes from the ball of the foot, keeping the toe joints straight. Splay the toes and draw them upward, still keeping the toe joints bet. Do this twelve times.

Ankle Exercise (A)

In the same position, bend the feet backwards so that the toes point upward, then down so that they point downwards. Repeat six times.

Ankle Exercise (B)

Sitting on a couch with the knees straight, feet out in front, circle the feet from the ankle, first clockwise, then anti-clockwise: six times each foot.

Ankle Exercise (C)

In the same position, turn the toes out and pull them up towards the outer sides of the ankles, feeling the pull as your stretch the inside of the ankles and contract the outside. Doe this twelve times, then reverse by turning the toes in and pulling the insides of the feet up towards the insides of the ankles: twelve times again.

Ankle Exercise (D)

In the same position, turn the soles inward to fact each other, then outward, keeping the knees together. Do this times.

ESSENTIAL CONCEPTS AND THEORIES

A. Factors Leading to Sports Injuries

Potential risks are inherited in different physical activities because of their nature. Body parts may be injured and most of these involve the muscular-skeletal system, such as bones, joints and soft tissues (examples include muscles, tendons, capsules, bursae and ligaments). If one is familiar with these factors, there is a greater chance of injury prevention or lessening the degree of injury.

(i) Environmental factors - They are the potential risky factors inducing injuries during physical activities.

Injuries occur if one is unaware of the environmental factors which include weather, facilities and equipment.

Weather - High temperature and humidity will hinder heat dissipation. This may induce heat cramps, heat exhaustion and heatstroke. Cold condition is associated with hypothermia. Rain or very high relative humidity can lead to a lack of movement control. Furthermore, the chance of suffering from stress induced by air pollution is higher for people with respiratory or cardiovascular diseases. In such circumstances, we should refer to the Air Quality Health Index and relevant guidelines provided by the Environmental Protection Department to decide whether or not to continue physical activities conducted outdoors.

(ii) Facilities and equipment - The facilities and equipment for various sports are different, that enough space is available for conducting activities. We should also consider the material and the hardness of the floor surface and the sequence of the physical activities to be held. This will reduce the chance of sports injuries. To safeguard participants' safety, sports facilities and equipment, such as goalposts and gymnastic apparatus, should be regularly checked and maintained in a good condition to ensure that they meet the necessary safety requirements.

Sports grounds - For any sport, the availability of a proper environment for athletes is vital to help reduce the chance of injuries. Many sports injuries are occur on playing fields. Regular maintenance helps keep them safe for use. Outdoor grass pitches, for example, should be mowed, watered and cleared of all foreign substances such as rocks, tin cans, etc. The surrounding of the playing field should not in any way heighten the possibility of an injury. Obstructions such as stakes, railings, etc. should be either removed or placed far enough away from the playing area. Indoor wooden floors should always be free of splinters and not too slick. To avoid ankle injuries, the curb on an athletics track should neither be too high nor too low.

Equipment - All equipment should be checked before

use, like gymnastic apparatus. The equipment installed in an open area should be inspected and maintained regularly to prevent sports injuries. Proper clothing should be worn for physical activities. For a long distance run, participants should wear breathable clothes. Besides, they should not wear shoes with improper fitting, or shoes made of inadequate impact-absorbing or excessively stiff materials.

(iii) Protective devices - Protective devices may reduce the risk of injury. Items such as helmets, safety goggles, mouthpieces, padding, shin / face-guards, knee straps etc. are all designed to reduce the chance of injury. It is essential that all equipment is specifically designed for the need of the players. To decrease the chance of injury, the equipment such as knee guards and ankle guards for stabilising and supporting the body parts is needed

(iv) Level of skill - Participants without adequate specific skills or knowledge face a greater chance of injury. This is especially true in contact sports like football or individual sports such as gymnastics and boxing. Participants should be aware of how to prevent injuries.

(v) Level of fitness - The knowledge, skills and fitness are important to prevent sports injuries. For example, sports injuries will be more likely to occur when the players' fitness level drops in contact sports like football and rugby. In gymnastic competitions, those without the endurance to withstand a routine are susceptible to injuries. A low level of flexibility will also cause muscle strain more easily.

(vi) Physical limitations - Participants should have the required physical capabilities, such as height, weight, strength and technique to take part in the activity. Players with a high arch or flat feet should wear suitable insoles to protect their feet. Eyesight can also be a contributing factor to the cause of injury. Poor eyesight can result in misjudgements and mistiming of actions in sports. For example, a player without proper contact lenses or glasses during competitions may make errors and this will increase the chance of sports injuries.

(vii) Nature of different sports - Some sports like boxing pose a greater threat of injury. Participants must be cautious of the potential risks and adopt preventive measures. Other sports, like rock climbing, require certain levels of physical fitness and technical expertise.

Level of contact - The level of contact in some sports, such as rugby and wrestling, has significant bearing on the likelihood of injury. The higher the level of contact is, the greater the likelihood of injury is. The preventive measures such as hamlets and gloves are to minimise the chance of injury instead of avoiding them. Other non-contact sports, such as tennis, do not have the same level of such risk.

Mismatching of players - There are great discrepancies among players in age, body type, etc. A fair competition takes place when the players are of equal capacity and ability. This is particularly important for students. Most school competitions are categorised by age so that students of a similar age will compete together to minimise the risk of injury. Competitions of many contact sports such as boxing, judo and wrestling are categorised by body weight for the same purpose.

B. Common sports injuries

We may suffer from various types of injuries when participating in sports activities. Participants of contact sports such as football and rugby will have a chance of sustaining injuries, for example, bleeding, contusion, abrasion, etc. Similarly, participants of continuous aerobic exercises such as marathon running and cycling etc., will be more likely to encounter overuse injuries like heat exhaustion or heat stroke, particularly in Hong Kong climate. Students should understand that any sport involves a risk of injury. Knowledge of the causes and treatment of common sports injuries enables students to take preventive measures and have rapid recovery after injury, leading to a quick return to sports participation.

(i) Bleeding - This is caused by rupture of blood vessels. External haemorrhage occurs when the skin and deeper tissues are cut, punctured or scraped. However, internal haemorrhage occurs when bleeding is from

internal organs without any breakage to the skin. Depending on the depth and severity of the wound, bleeding can be a significant injury, and needs to be stopped as soon as possible. It is also important to clean the wound and prevent it from becoming infected, as this can slow down the recovery process.

(ii) Abrasion - This is the rubbing or scraping off of the skin or a mucous membrane. This may be of any grade of severity from a simple scraping away of a layer of skin to very extensive damage. An area with firm underlying tissue, such as the shin or iliac crest, is the most susceptible to damage. When an abrasion occurs, an injury to deeper structures has been ruled out, and the most immediate concern is the prevention of infection.

(iii) Contusion - injury to soft tissue (Musculoskeletal injuries)

A contusion, which is a soft tissue injury, occurs when tissues have been injured by being hit by a blunt object, usually as a result of direct trauma, without any breakage to the skin. This generally is a result of capillaries rupture causing bleeding and an inflammatory reaction and some local swelling. Pains will be felt when the lesion is pressed and malfunction of muscular contraction occurs.

Normal skin:

Bruise (Contusion):

(iv) Dislocation - injury to joint (Musculoskeletal injuries)

This is the displacement of a bone from a joint by a violent movement at a joint. This may be associated with damage to the ligaments, muscles or bones surrounding the joint. Swelling around the joint, joint deformation, severe pain and inability of movement may occur. Joint stability can be regained by physical rehabilitation or surgical tightening of the surrounding muscles or ligaments. Inadequate treatment may lead to recurrent dislocation when the joint repeatedly dislocates.

(v) Fracture - injury to bone

When a bone is hit, compressed or twisted, a break occurs. Bone fractures can be classified into many types, depending on the condition of the overlying skin.

Closed fracture - This type of fracture has a reduced risk of infection as it does not protrude through the skin, but it often causes a noticeable deformity. Closed fractures can be classified by the mechanism of how the injury was sustained.

- **Direct trauma:** A direct blow to the bone causing it to break.
- **Avulsion fracture:** This occurs when a sprained ligament pulls off a piece of bone, for example, in the ankle or finger. An avulsion fracture can also be "open" if the overlying skin is broken.
- **Stress fracture:** This may happen when excessive pressure is placed on a bone over an extended period of time and as a result the bone becomes weaker and eventually succumbs to the pressure and breaks.

In addition, special precautions should be taken to protect young athletes. An epiphyseal or growth plate fracture often occurs when athletes are 18 or younger. The injury to the cartilage at the ends of bones can affect bone growth in the long term.

Open fracture - This happens when a broken bone pierces the skin, exposing the bone and muscle tissue. These kinds of fractures are uncommon in a sports environment. There is a high risk of infection of the exposed fractured bone and emergency surgery is needed to clean up the wound.

(vi) Pulled / Strained muscle - injury to muscle

When a muscle is forcefully or excessively shortened or stretched, it can become strained or "pulled", which is a tearing or even rupture of the muscle fibres or tendons. This will cause an inflammatory response with swelling and disruption to adjacent fibres. There is a sense of pain and tenderness and a bruise occurs later. Muscle strains are classified into three grades: grade I (minor), grade II (moderate) and grade III (severe).

(vii) Sprain - injury to ligaments

This is a stretch or tearing injury to a ligament caused by compression, twisting or torsion. As with strains, there are three grades, depending on severity. Minor sprains cause minimal to no swelling and do not affect the ability

of mobility, whereas severe sprains can result in complete tears with extreme pain and widespread swelling. Sprained ligaments can take anywhere from six to twelve weeks to heal fully.

(viii) Heat and Cold Injuries - Environmental injuries Heat injuries - Heat-related injuries occur typically in conditions where exercise is taking place in conditions where the body is struggling to cool down naturally due to the air temperature and humidity. The three most common heat-related illnesses are heat cramps, heat exhaustion and heat-stroke.

Heat cramps - These are caused by dehydration, electrolyte loss, decreased blood flow to the muscles and fatigue. Individuals generally show symptoms of heat cramps after periods of heavy and prolonged sweating. Often these can result in spasms of the quadriceps, hamstrings or calves. An athlete should not resume the activity unless the spasms stop or he can continue without pain.

Heat exhaustion - This is the most common form of heat illness. It is a "functional" illness and not associated with any organ damage. It is a shock-like condition caused by dehydration and a suffering individual will experience headaches, nausea, dizziness and chills. An athlete should not resume the activity without a doctor's permission after an examination.

Heatstroke - This is a life-threatening condition in which the body temperature rises to a dangerously high level. It is distinguished from heat exhaustion by the presence of tissue injury. Heatstroke usually results from a malfunction of the brain's temperature control centre, which causes dehydration, fever or the disruption of the body's temperature regulation. Common signs of heatstroke can be observed as a rapid pulse and breathing rate, vomiting, confusion, etc. An athlete should return to the activity only with a doctor's permission

Cold injuries - These injuries occur due to a lowering of the core body temperature.

Frostbite - When exposed to a particularly cold environment, the blood flow to peripheral structures will

be cut off to preserve core body temperature, resulting in frostbite, a medical condition in which cold weather seriously damages skin tissues. This injury mainly affects the feet, hands, ears and nose and is quite rare in sporting situations. There are three stages of frostbite ranging from initial numbness to dry black blistering of the skin.

Hypothermia - This is a condition that occurs when the temperature of the body drops below 90°F (32°C), and is caused by exposure to an extremely wet, windy and cold environment. Symptoms of this condition include an altered level of consciousness and depressed vital signs of life. Should this happen to any athlete, they should not return to sport without being checked and getting the doctor's permission.

Wind chill - Air movement will carry heat away from your body so you will feel colder in a windy day than what the thermometer measures. This effect, termed "wind chill", will be more significant with increasing wind speed. In some countries like U.S. and Canada, the "wind chill temperature" is reported along with the actual temperature measured. The "wind chill temperature" was developed based on scientific research involving human volunteers and computer modeling, as well as medical understanding of how the body loses heat when exposed to cold.

(ix) Overuse injuries - These are caused by repetitive force transmitted to bones, joints and muscles over time. Overuse injuries are usually the result of over-ambitious training programmes. In this case, the body is attempting to do too much too soon, when it is not ready for the load. Sometimes an overuse injury occurs when the body is unable to handle the work load to which it has adapted due to mechanical fatigue. Bones, for example, get weaker if excess force is exerted on the body during this re-adaptation phase. Stress fractures and other overuse injuries are likely to occur. Athletes could prevent many overuse injuries from occurring by increasing flexibility; as well as developing adequate strength, power and endurance in all muscle groups.

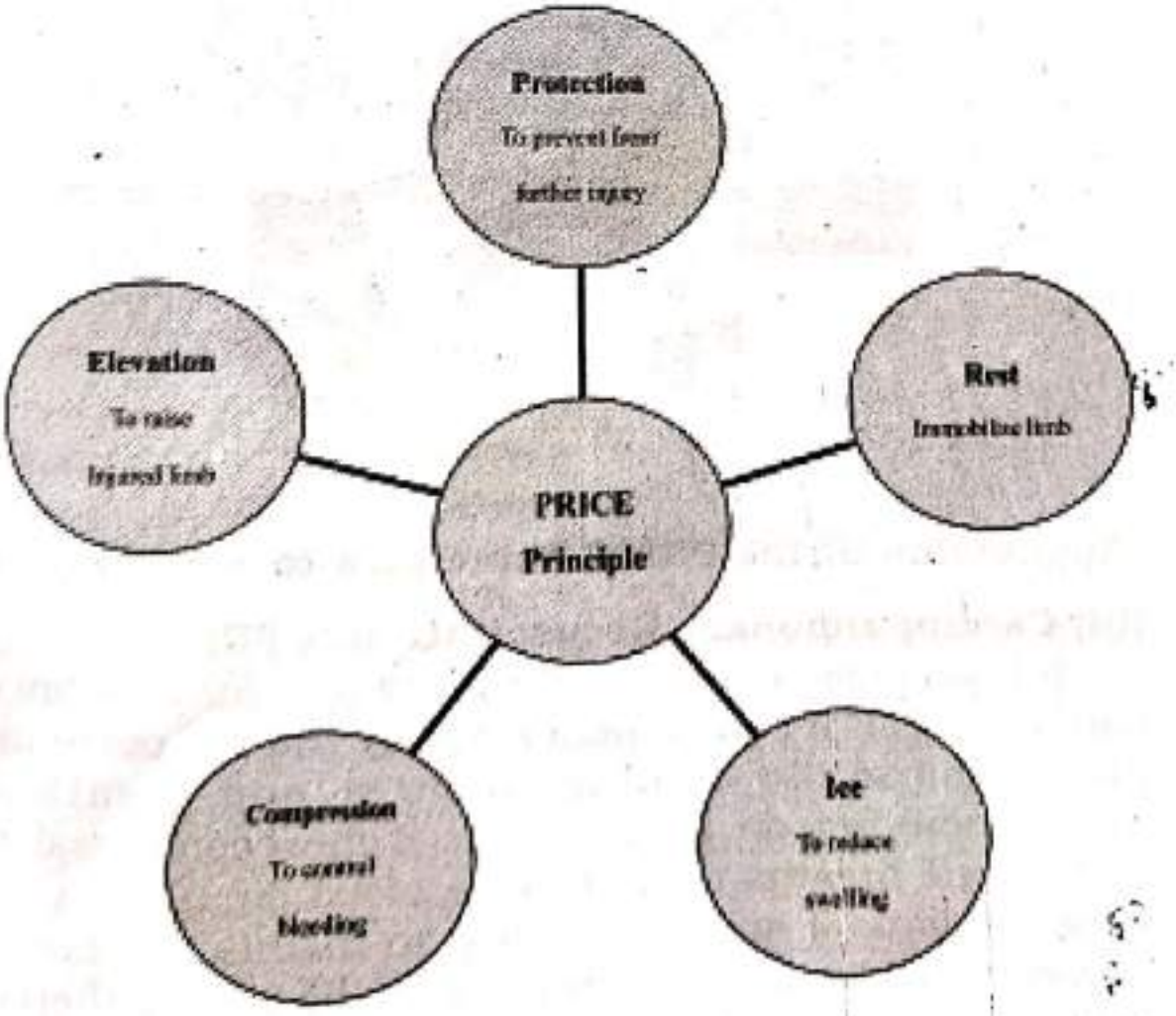
C. Treatment

General principles of first aid - It is of paramount importance that every sports injury should be treated as soon as possible, regardless of how minor it seems to be. Provision of adequate first aid supplies such as bandages, gauzes, sterile pads, tape, etc., is important. Students will often find themselves in accidents during excursions and outdoor recreation activities. When immediate medical care is not available for outside school accidents, the basic first aid outlined in this section may be applied to the injured before medical assistance arrives to prevent wound deterioration.

(i) PRICE principles

Protection - It aims to protect the injured from further injury by preventing him/her from being moved and keeping other athletes and hazards away from him/her.

Rest - Any injured limb should be immobilised either by applying a splint or stabilisers. Any return to exercise



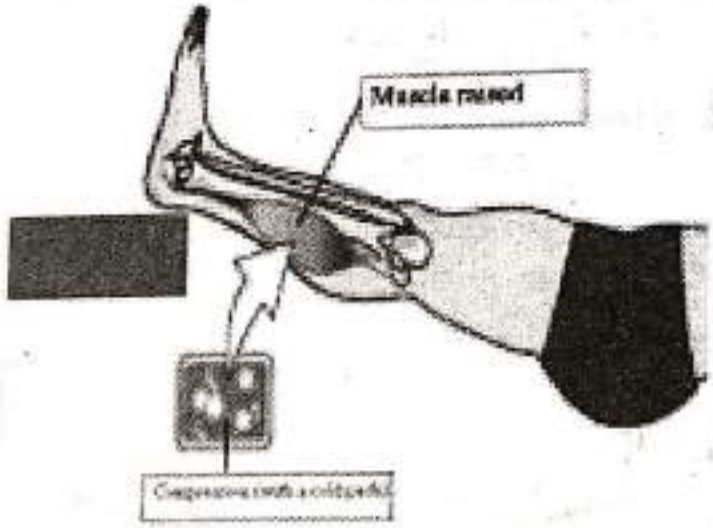
The Basics of the PRICE Principles

should be slow and gradual, if the injured is able to move the affected area without pain.

Ice - Pain and swelling caused by bleeding and fluid loss can be minimised by the application of ice during the first 72 hours after the occurrence of an injury. This can be applied in the form of an ice-pack, gel, ice-water, etc. and should not be used for longer than 10 to 20 minutes in any one hour.

Compression - This helps control initial bleeding and reduce residual swelling. This is very useful when applied to injured limbs, especially the feet, ankles, knees, thighs, hands or elbows. Compression commonly comes in the form of an elastic wrap.

Elevation - The elevation of an injured limb above the level of the heart can help minimise initial tissue bleeding when it is used in conjunction with ice and compres:

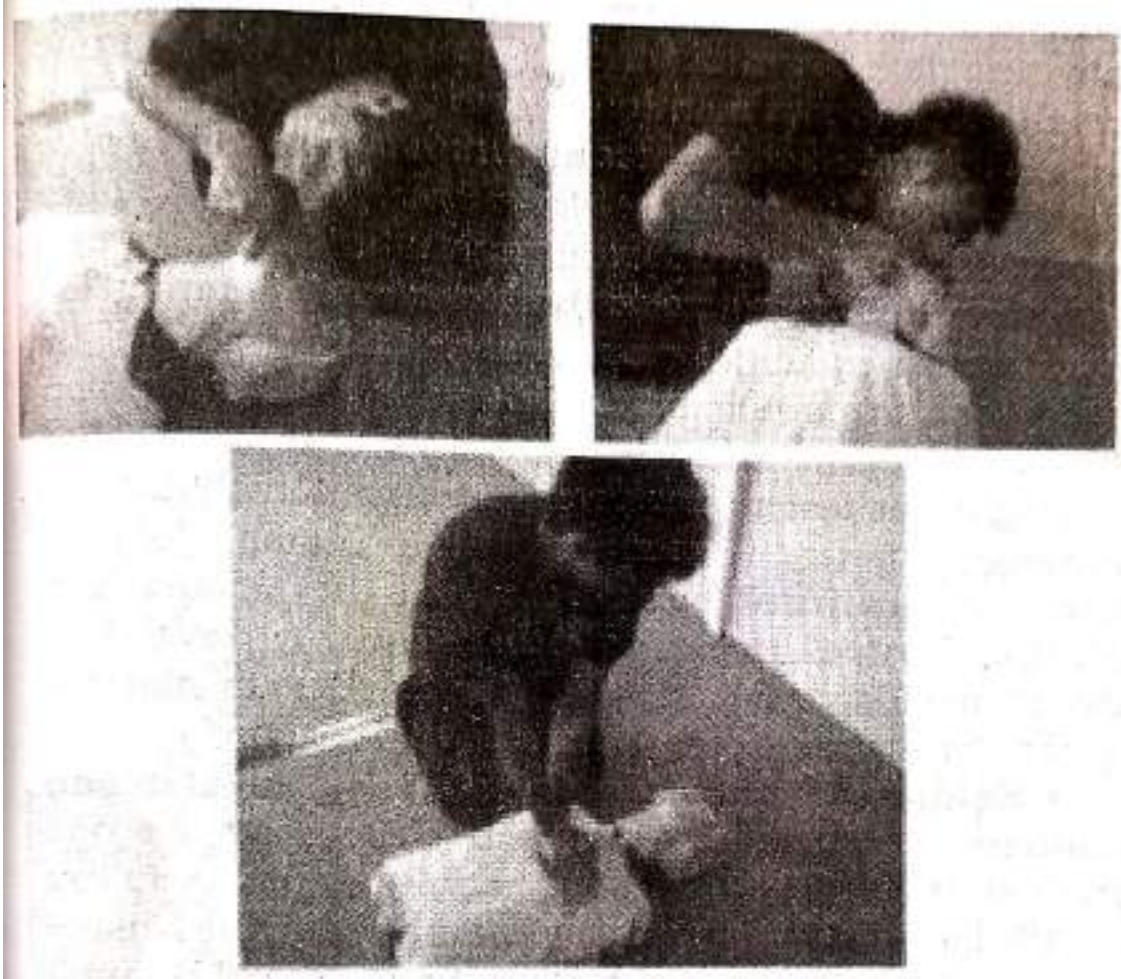


Application of the PRICE Principles to a calf injury

(iii) Cardiopulmonary Resuscitation (CPR)

It is an emergency first aid procedure for a victim of cardiac arrest. It can be performed by trained personnel and is normally conducted on a non-breathing unconscious person. CPR consists of chest compressions and rescue breaths (i.e., artificial blood circulation and lung ventilation) and is intended to maintain a flow of oxygenated blood to the brain and the heart, thereby delaying tissue death and extending the brief window of

opportunity for a successful resuscitation without permanent brain dmage.



CPR Helps to Maintain a Flow of Oxygenated Blood to the Brain

D. Prevention of sports injuries

(i) Risk Assessment - There should be careful consideration of the potential risks before taking part in physical activities, including environmental risks, player-related risks and sport-related risks. In addition, it would be wise to note the following:

• **"Physical Activity Readiness Questionnaire" -** It is commonly referred to as PAR-Q, a questionnaire developed by the Canadian Society for Exercise Physiology to help the general public to decide whether or not they should check with their doctors before participation in physical activities. The PAR-Q contains seven questions, mainly on the cardiovascular and musculoskeletal systems. If the answer to one or more of the questions is

"Yes", it is recommended that a doctor should be consulted before an individual participates in physical activities. The PAR-Q has been widely used in Europe and the United States and is becoming common in Hong Kong as well. At present, the Leisure and Cultural Services Department requires completion of the PAR-Q by those who wish to enrol as participants in physical activities.

• **Qualifications of activity coaches/managers-** Activities led by unqualified personnel pose potentially higher risk to participants. This is why the Education Bureau recommends that teachers without proper training in the teaching of physical education should not be assigned to teach the subject. By the same token, all sport coaches hired by schools and the Leisure and Cultural Services Department must hold a "Level 1 or above" coaching certificate issued by a relevant national sports association in the activities they coach.

• **Equipment and Facilities** - Using substandard equipment or facilities will clearly increase the risk involved in physical activities. For example, nets are installed at some public beaches managed by the Leisure and Cultural Services Department to guard against sharks; swimming at these beaches carries a lower risk.

• **Potentially Dangerous Activities-** We need to consider whether or not an activity may bring about serious or fatal injuries. In general, activities that pose extremely high challenges to one's physical fitness, involve frequent collisions (with objects or other people), are adventurous in nature or conducted in water etc., are potentially more dangerous. We must carefully assess our physical and psychological state, as well as our skill and knowledge levels, when considering whether or not to take part in such activities.

(ii) Safety measures - We should note the following when participating in physical activities:

• Maintain a high level of awareness of preventing sport injuries and strive to ensure our own safety and that of other people.

• Plan for slow and gradual progress; learn the correct techniques; have sufficient rest; and strengthen the

injury-prone or relatively weak body parts.

• Dress appropriately; tie up long hair and trim fingernails; if we need to wear spectacles during physical activities, we must secure the spectacles which should be made of non-breakable materials; and do not wear jewellery or watches during activities.

• Thoroughly "warm up" before engaging in physical activities; do not engage in activities that are beyond our physical capabilities; pay attention to our physical condition; and report any symptom of illness and seek help as soon as possible.

• Look for safe venue with adequate space for physical activities; protective materials should be installed over glass windows and doors, lights, pillars, fans, sharp edges, etc. that are in close vicinity to the activity area; be aware of the potential hazards of the activities and the environment and do not use those facilities which do not meet the safety requirements.

• Pay attention to weather reports to determine whether activities should be carried out as scheduled.

• Air Quality Health Index (AQHI) -When the "Health Risk Category" (HRC) reaches "High" level (AQHI: Band 7), people who are sensitive to air pollution (e.g. children, the elderly, people with heart or respiratory illnesses) are advised to reduce outdoor physical exertion, and to reduce the time of their stay outdoors, especially in areas with heavy traffic. When HRC reaches "Very High" level (AQHI: Band 8-10), the general public is advised to reduce outdoor physical exertion, and to reduce the time of their stay outdoors, especially in areas with heavy traffic. When the HRC reaches "Serious" level (AQHI: Band 10+), the general public is advised to reduce to the minimum outdoor physical exertion, and to reduce to the minimum the time of their stay outdoors, especially in areas with heavy traffic.

• **Ultraviolet radiation (UV)** - When the UV index is 6 or above, take appropriate measures to protect the skin, such as applying sunscreen, wearing a wide-brimmed hat, UV-blocking sunglasses and long-sleeved loose clothing.

• **Hot and humid conditions** - One should acclimatise oneself to hot and humid conditions gradually; wear light clothing made of cotton or porous material; drink cool plain water whenever necessary to replenish fluid loss; arrange short rests at frequent intervals for prolonged physical activities; and be aware of the symptoms of heat-related illnesses and take any necessary action such as resting in a cool shaded place, drinking water and seeking medical assistance if needed.

(iii) Warm up and cool down - Warm up and cool down exercises help individuals to adjust the cardiovascular, respiratory and nervous systems to adapt to the changing demand of the forthcoming strenuous exercise and the ensuing recovery phase, rest to exercise and from exercise to rest respectively.

• The effects of warm up:

- Increases the heart rate and causes capillaries to dilate; these enable oxygen in the blood to travel faster, implying that the muscles become fatigued more slowly.
- Increases the secretion of sensorial fluid that lubricates the joints; this reduces their friction.
- Decreases the viscosity within the muscles; this lets the muscle fibres have greater extensibility and elasticity as well as stronger contraction.

• The effects of cool down:

- Helps remove lactic acid, which can cause cramp and stiffness.
- Allows the heart rate to return to the resting rate.

• Recommended activities for warm up and cool down:

- Depending on the exercise intensity, participants' age and risk for heart disease, the duration of warm up and cool down may range from 5 to 15 minutes.
- General warm up includes light activities such as jogging, joint mobility exercise, static stretching, etc.
- Specific warm up involves movements similar to those used in the ensuing exercise, including drills and games that are performed at low to moderate intensity, i.e., not greater than 50% of the full workload.
- Cool down exercises are similar to the warm up exercises.

6

Definition, Guiding Principles of Physiotherapy and Importance of Physiotherapy

PHYSIOTHERAPY—MEANING AND DEFINITION

Physiotherapy plays an integral part in the multi-disciplinary approach to the management of sports injuries. The aim of physiotherapy is to treat and fully rehabilitate the athlete post-injury, post-operatively, to prevent further injury and to return the athlete to sport in the shortest possible time.

Physical therapy (or physiotherapy), often abbreviated PT, is a health care profession which aims the physical treatment and management of disease or condition which enables people to reach their maximum potential. 'Physical therapists' (or physiotherapists) are primary health care professionals who diagnose and treat individuals of all ages, from newborns to the very oldest, who have medical problems or other health-related conditions, illnesses, or injuries that limit their abilities to move and perform functional activities as well as they would like in their daily lives. Physical therapists examine each individual and develop a plan using treatment techniques to promote the ability to move, reduce pain, restore function, and prevent disability. In addition, PTs work with individuals to prevent the loss of mobility before it occurs by developing fitness and wellness-oriented programs for healthier and more active lifestyles, providing services to individuals and populations to develop, maintain and restore maximum movement and functional ability throughout the lifespan. This includes providing services in circumstances where movement and function are threatened by aging, injury, disease or environmental factors. Functional movement is central to what it means to be healthy.

Physical therapy is concerned with identifying and

maximizing quality of life and movement potential within the spheres of promotion, prevention, treatment/ intervention, habilitation and rehabilitation. This encompasses physical, psychological, emotional, and social well being. Physical therapy involves the interaction between physical therapist, patients/clients, other health professionals, families, care givers, and communities in a process where movement potential is assessed and goals are agreed upon, using knowledge and skills unique to physical therapists. Physical therapy is performed by a physical therapist (PT) or physiotherapist (physio), and sometimes services are provided by an assistant (PTA) acting under their direction.

PTs use an individual's history and physical examination to arrive at a diagnosis and establish a management plan and, when necessary, incorporate the results of laboratory and imaging studies. Electrodiagnostic testing (e.g., electromyograms and nerve conduction velocity testing) may also be of assistance. PT management commonly includes prescription of or assistance with specific exercises, manual therapy, education, manipulation and other interventions.

Physical therapy has many specialties including cardiopulmonary, geriatrics, neurologic, orthopaedic and pediatrics, to name some of the more common areas. PTs practice in many settings, such as outpatient clinics or offices, inpatient rehabilitation facilities, skilled nursing facilities, extended care facilities, private homes, education and research centers, schools, hospices, industrial workplaces or other occupational environments, fitness centers and sports training facilities.

Physical therapists also practice in non-patient care roles such as health policy, health insurance, health care administration and as health care executives. Physical therapists are involved in the medical-legal field serving as experts, performing peer review and independent medical examinations.

Specialties list eight specialist certifications.

Cardiovascular & Pulmonary

Cardiovascular and pulmonary rehabilitation physical therapists treat a wide variety of individuals with cardiopulmonary disorders or those who have had cardiac or pulmonary surgery. Primary goals of this specialty include increasing endurance and functional independence. Manual therapy is used in this field to assist in clearing lung secretions experienced with cystic fibrosis. Disorders, including heart attacks, post coronary bypass surgery, chronic obstructive pulmonary disease, and pulmonary fibrosis, treatments can benefit from cardiovascular and pulmonary specialized physical therapists.

Clinical Electrophysiology

This specialty area encompasses electrotherapy/ physical agents, electrophysiological evaluation (EMG/ NCV), physical agents, and wound management.

Geriatric

Geriatric physical therapy covers a wide area of issues concerning people as they go through normal adult aging but is usually focused on the older adult. There are many conditions that affect many people as they grow older and include but are not limited to the following: arthritis, osteoporosis, cancer, Alzheimer's disease, hip and joint replacement, balance disorders, incontinence, etc. Geriatric physical therapists specialize in treating older adults.

Integumentary

Integumentary (treatment of conditions involving the skin and related organs). Common conditions managed include wounds and burns. Physical therapists utilize

surgical instruments, mechanical lavage, dressings and topical agents to debride necrotic tissue and promote tissue healing. Other commonly used interventions include exercise, edema control, splinting, and compression garments.

Neurological

Neurological physical therapy is a field focused on working with individuals who have a neurological disorder or disease. These include Alzheimer's disease, Charcot-Marie-Tooth disease (CMT), ALS, brain injury, cerebral palsy, multiple sclerosis, Parkinson's disease, spinal cord injury, and stroke. Common impairments associated with neurologic conditions include impairments of vision, balance, ambulation, activities of daily living, movement, muscle strength and loss of functional independence. Physiotherapy can address many of these impairments and aid in restoring and maintaining function, slowing disease progression, and improving quality of life.

Orthopedic

Orthopedic physical therapists diagnose, manage, and treat disorders and injuries of the musculoskeletal system including rehabilitation after orthopaedic surgery. This specialty of physical therapy is most often found in the out-patient clinical setting. Orthopedic therapists are trained in the treatment of post-operative orthopedic procedures, fractures, acute sports injuries, arthritis, sprains, strains, back and neck pain, spinal conditions and amputations.

Joint and spine mobilization/manipulation, therapeutic exercise, neuromuscular reeducation, hot/cold packs, and electrical muscle stimulation (e.g., cryotherapy, iontophoresis, electrotherapy) are modalities often used to expedite recovery in the orthopedic setting. Additionally, an emerging adjunct to diagnosis and treatment is the use of sonography for diagnosis and to guide treatments such as muscle retraining. Those who have suffered injury or disease affecting the muscles, bones, ligaments, or tendons will benefit from assessment by a physical therapist specialized in orthopedics.

Vestibular

Vestibular physiotherapy often coexists with neurological or orthopedic programs. Physiotherapists with knowledge in vestibular rehabilitation can effectively reduce the symptoms associated with vestibular conditions (vertigo, disequilibrium, mobility and balance disturbances) through the use of individualized intervention programs. Vestibular rehabilitation usually includes one or more of the following: education, physical repositioning maneuvers, balance and gait exercises, and head and body positioning techniques. Vestibular rehabilitation is shown to be highly effective in the reduction of symptoms due to unilateral peripheral vestibular dysfunctions.

Vestibular physiotherapists are also essential in identifying vestibular symptoms that may be related to a more severe condition and making referrals onto the appropriate medical professional for further investigation.

Pediatric

Pediatric physical therapy assists in early detection of health problems and uses a wide variety of modalities to treat disorders in the pediatric population. These therapists are specialized in the diagnosis, treatment, and management of infants, children, and adolescents with a variety of congenital, developmental, neuromuscular, skeletal, or acquired disorders/diseases. Treatments focus on improving gross and fine motor skills, balance and coordination, strength and endurance as well as cognitive and sensory processing/integration. Children with developmental delays, cerebral palsy, spina bifida, or torticollis may be treated by pediatric physical therapists.

Goals, Treatment and Rehabilitation

1. Protect the injured tissues to allow healing and to control the early inflammatory phase.

2. Rehabilitate flexibility, strength, proprioception, and muscle imbalance, and control physical activities with the aid of taping and splinting.

3. Sport-specific activities must be tested to ensure the athlete can return to sport safely.

If proper rehabilitation is not undertaken, the athlete may be competing too soon, with residual instability, proprioceptive disturbance and muscle weakness and imbalances. Individual programmes must be planned and implemented for each athlete. This would include sport-

specific exercises, adaptation to new postures to correct muscle imbalance, taping and strapping and a home exercise programme.

The athlete must be progressed carefully from one phase to the next, and the criteria for progression are based on function, not time. Sport-specific functional testing is an essential part of moving from one phase of rehabilitation to the next, and finally, to full participation. Overtraining must be very carefully avoided in all of these phases, and training is monitored so that full activity does not occur before full recovery has taken place.

It is obvious that prevention is better than cure and the physiotherapist will always advise the patient on how to prevent recurrence of the injury on return to sport.

Rose Macdonald

GUIDING PRINCIPLES OF PHYSIOTHERAPY

Physical therapy has outlived and lived down the false theory that its results are psychic. This is in direct opposition to a statement made to me by a general practitioner that in dealing with sexual impotence, electrotherapy, in his hands, has imaginary results. Small wonder, because if the diagnosis is incomplete the treatment will be inadequate. Furthermore, we cannot deny possible and future results measured in terms of actual and present results, because all our sciences are progressing amazingly into fields unknown. It is high time for a real search for truth, accepting new methods, not without due consideration and test, but with realization that every mode of treatment may possess great merit, and if it does the really scientific physician will employ it, which the patient feels very definitely and may complain about, especially if followed by a reaction after treatment, usually indicate a current so strong that it is apt to defeat its own object. Conversely, a current which the patient

does not feel except to describe it as soothing is the very one which is going to do the good." Periods of rest, imitating the heart action, are paramount. Fatigue is never advisable in medicine, whether produced by physical exercise, exhibition of medicines, or application of electrical and other physical measures. Our organs are essentially delicate, particularly in their cellular structure.

Correct and full diagnosis is absolutely necessary, and equally important is the quality of the treatment which I have elsewhere described in these words?

"Long treatments of twenty, thirty and forty minutes are the ones which produce the results. During the period of lowest resistance, it is probable that daily treatments are most advisable. For example, one of my friends in the insurance compensation field has found that a daily radiant light treatment in indolent cases will maintain the rate of healing very much better than every other day, although each session may be a half hour long. The physiological results are more important than meter indications, and in diathermy they are more important than thermometer indications because a thermometer cannot possibly reach wherever the current passes. Subjective sensations are important. Those which the patient feels very definitely and may complain about, especially if followed by a reaction after treatment, usually indicate, a current so strong that it is apt to defeat its own object. Conversely, a current which the patient does not feel except to describe it as soothing is the very one which is going to do the good.

Periods of rest, imitating the heart action, are paramount. Fatigue is never advisable in medicine, whether produced by physical exercise, exhibition of medicines, or application of electrical and other physical measures. Our organs are essentially delicate, particularly in their cellular structure.

To project a strong electric current at the prostate or the uterus is as foolish as to knock the patient down with a stream of water or to rupture the cervix or the urethra by divulsion wrongly called dilatation. Hence such modalities as the static wave current should be

interrupted with the metronome and oscillating currents, such as the galvanic sinusoidal, should be preferred. Variations in these currents should be timed to agree with the pulse rate or a multiple or a subdivision thereof. Patients should always be allowed to rest for a few moments after treatment. Pain excited or augmented by the treatment always indicates decrease in the energy or change in the character of the current. After-effects of this type must not occur.

Adjuvants must not be neglected, such as attention to the general strength and health, and variation in methods. Hydrotherapy and massage should always be used as associate methods, and practically all electrical modalities should be varied

The following are the guiding principles of physiotherapy:-

- **Access** – the timely use of personal health services (e.g., physical therapist services) to achieve the best possible health outcomes (Access to Health Care in American (1993),
- **Accountability** – active acceptance of the responsibility for the diverse roles, obligations, and actions of the physical therapist including self-regulation and other behaviors that positively influence patient/client outcomes, the profession and the health needs of society.
- **Autonomy** – Autonomous physical therapist practice is characterized by independent, self-determined professional judgment and action.
- **Patient centered** – providing care that is respectful of and responsive to individual patient preferences, needs, and values and ensuring that patient values guide all clinical decisions (Crossing the Quality Chasm, Institute of Medicine (2001))
- **Value** – "the health outcomes achieved per dollar spent" (Porter, NEJM, 2009) – incorporates quality and cost-effectiveness

Definitions embedded within these principles:

- **Professional integrity** – steadfast adherence to high ethical principles or professional standards; truthfulness, fairness, doing what you say you will do, and "speaking

forth" about why you do what you do.

• **Quality** – The six aims to improve the quality of health care are that health care should be safe, effective, patient-centered, timely, efficient, and equitable (Crossing the Quality Chasm, Institute of Medicine (2001)). These aims are achieved through adherence to best practices or standards of care. Problems with quality health care include overuse, underuse and misuse.

• **Cost effectiveness** – a comparison of costs in monetary units with outcomes in quantitative nonmonetary units (e.g., reduced mortality or morbidity).

Principle #1: Physical therapists shall respect the inherent dignity and rights of all individuals. (Core Values: Compassion, Integrity)

1A. Physical therapists shall act in a respectful manner toward each person regardless of age, gender, race, nationality, religion, ethnicity, social or economic status, sexual orientation, health condition, or disability.

1B. Physical therapists shall recognize their personal biases and shall not discriminate against others in physical therapist practice, consultation, education, research, and administration.

Principle #2: Physical therapists shall be trustworthy and compassionate in addressing the rights and needs of patients/clients. (Core Values: Altruism, Compassion, Professional Duty)

2A. Physical therapists shall adhere to the core values of the profession and shall act in the best interests of patients/clients over the interests of the physical therapist.

2B. Physical therapists shall provide physical therapy services with compassionate and caring behaviors that incorporate the individual and cultural differences of patients/clients.

2C. Physical therapists shall provide the information necessary to allow patients or their surrogates to make informed decisions about physical therapy care or participation in clinical research.

2D. Physical therapists shall collaborate with patients/clients to empower them in decisions about their

health care.

2E. Physical therapists shall protect confidential patient/client information and may disclose confidential information to appropriate authorities only when allowed or as required by law.

Principle #3: Physical therapists shall be accountable for making sound professional judgments. (Core Values: Excellence, Integrity)

3A. Physical therapists shall demonstrate independent and objective professional judgment in the patient's/client's best interest in all practice settings.

3B. Physical therapists shall demonstrate professional judgment informed by professional standards, evidence (including current literature and established best practice), practitioner experience, and patient/client values.

3C. Physical therapists shall make judgments within their scope of practice and level of expertise and shall communicate with, collaborate with, or refer to peers or other health care professionals when necessary.

3D. Physical therapists shall not engage in conflicts of interest that interfere with professional judgment.

3E. Physical therapists shall provide appropriate direction of and communication with physical therapist assistants and support personnel.

"Principle #4: Physical therapists shall demonstrate integrity in their relationships with patients/clients, families, colleagues, students, research participants, other health care providers, employers, payers, and the public. (Core Value: Integrity)

4A. Physical therapists shall provide truthful, accurate, and relevant information and shall not make misleading representations.

4B. Physical therapists shall not exploit persons over whom they have supervisory, evaluative or other authority (e.g., patients/clients, students, supervisees, research participants, or employees).

4C. Physical therapists shall discourage misconduct by health care professionals and report illegal or unethical acts to the relevant authority, when appropriate.

4D. Physical therapists shall report suspected cases of abuse involving children or vulnerable adults to the appropriate authority, subject to law.

4E. Physical therapists shall not engage in any sexual relationship with any of their patients/clients, supervisees, or students.

4F. Physical therapists shall not harass anyone verbally, physically, emotionally, or sexually.

Principle #5: Physical therapists shall fulfill their legal and professional obligations. (Core Values: Professional Duty, Accountability)

5A. Physical therapists shall comply with applicable local, state, and federal laws and regulations.

5B. Physical therapists shall have primary responsibility for supervision of physical therapist assistants and support personnel.

5C. Physical therapists involved in research shall abide by accepted standards governing protection of research participants.

5D. Physical therapists shall encourage colleagues with physical, psychological, or substance-related impairments that may adversely impact their professional responsibilities to seek assistance or counsel.

5E. Physical therapists who have knowledge that a colleague is unable to perform their professional responsibilities with reasonable skill and safety shall report this information to the appropriate authority.

5F. Physical therapists shall provide notice and information about alternatives for obtaining care in the event the physical therapist terminates the provider relationship while the patient/client continues to need physical therapy services.

Principle #6: Physical therapists shall enhance their expertise through the lifelong acquisition and refinement of knowledge, skills, abilities, and professional behaviors. (Core Value: Excellence)

6A. Physical therapists shall achieve and maintain professional competence.

6B. Physical therapists shall take responsibility for their professional development based on critical self-

assessment and reflection on changes in physical therapist practice, education, health care delivery, and technology.

6C. Physical therapists shall evaluate the strength of evidence and applicability of content presented during professional development activities before integrating the content or techniques into practice.

6D. Physical therapists shall cultivate practice environments that support professional development, lifelong learning, and excellence.

Principle #7: Physical therapists shall promote organizational behaviors and business practices that benefit patients/clients and society. (Core Values: Integrity, Accountability)

7A. Physical therapists shall promote practice environments that support autonomous and accountable professional judgments.

7B. Physical therapists shall seek remuneration as is deserved and reasonable for physical therapist services.

7C. Physical therapists shall not accept gifts or other considerations that influence or give an appearance of influencing their professional judgment.

7D. Physical therapists shall fully disclose any financial interest they have in products or services that they recommend to patients/clients.

7E. Physical therapists shall be aware of charges and shall ensure that documentation and coding for physical therapy services accurately reflect the nature and extent of the services provided.

7F. Physical therapists shall refrain from employment arrangements, or other arrangements, that prevent physical therapists from fulfilling professional obligations to patients/clients.

GENERAL OBJECTIVES IN PHYSIOTHERAPY

The general and the specific-intermediate objectives refer directly to the maintenance and/or the improvement of the functionality state of each of the patient's affected apparati and systems. This is determined by the whole pathological state installed and issues from the correct and complete evaluation of the medical recovery team. The functionality of an affected structure regards a multitude of factors which have to be in a harmonious rapport of inter-conditioning. For example, the recovery of the knee function post-traumatically requires an accord between the recovery of several aspects (force, mobility, stability, balance, coordination etc.) because all are subdued and must solve the main functionality problem of the lower limb = walking, locomotion. But regarding this as the recovery of the patient to the state before the pathologic event (the achievement of the finality type objective), we can hope for the rehabilitation of a possible functional maximum. To conclude, the general objectives (written in bold and italics) and those specific-intermediate (which derive from those general and the exemplification cf which is not to be wasted in this paper) hereinafter described are subordinated to the finality –type objectives.

The facilitation of relaxation

- The abatement of pain through relaxation at the SNC level;
- The abatement of pain through relaxation at the local level;
- Contraction abatement (and the muscle retraction) in post-traumatic/rheumatological/central and

peripheral neurological affections;

• The growth of psychic and physical comfort, the averting of distress effects;

• The improvement of motion control performance;

• The growth and the improvement of the control over some body functions (respiratory, cardio-vascular, digestive and uro-genital;

• The promotion of the active and conscious participation within the recovery programme;

• The diminution/rebutment of involuntary movement;

• Relaxation for the initiation and the realization of ideo-motility practice.

Sensitiveness Re-education

• Getting the capacity to notice the particular excitation in exteroception-proprioception-interoception;

• The improvement of the capacity of topographic localization for a specific excitation;

• The re-composition on sensitive homunculus of the "map sensitiveness";

• The growth of the capacity of specific discrimination for all types of sensitiveness exteroception-proprioception-interoception;

• The promoting of all types of child sensitivity, in accordance with the psycho-neuromobile development stages;

• The maintenance of an optimum level of sensibilities necessary to the quality of third age people;

• The perfecting of complex types of sensibilities specific to some human activities (the space-temporal sense, the sense of prehension, musical instrument, sportsmen);

• The realization of an abnormality state for some deficient attitudes/substituted movement;

• The recovery of the sensibility components of the oro-facial function: mastication/taste, deglutition, olfaction, phonation + capacity of communication;

• The recovery of the sensitiveness of the sphincterian

IMPORTANCE OF PHYSIOTHERAPY

If pain is a problem then physiotherapy is the solution. Study and experiences prove that physiotherapy has been a very effective tool against pains and injuries ranging from minor to major. Hence the prescription of physiotherapy can never be a wrong one in case of curing pain or injury.

In case when a joint complication is to be dealt with by the help of physiotherapy, a physiotherapist may twist or fold the limbs having infirmities into positions which are not usually posed i.e. contortion may be the part of physiotherapeutic treatment.

To get rid of muscle tenancy or immobility the physiotherapist may suggest stretches, exercises, heat therapy, massage or traction and such things alone or they may be coupled and grouped as well as per the seriousness or condition of the problem. To escape from head ache or muscle ache sometimes painkiller are effective but they have limitations and side effects as well but physiotherapy deals with pains and injuries of upper tiers. Hence its importance can't be denied in any way.

Physiotherapy not only helps us to be escaped from pains and injuries on table but it saves us from further such ailments. Healthcare professionals actually admit the importance of physiotherapy when they put stress on saying that heavy object should be picked up using knee bends instead of waist to avoid arousal of any deformity of the back bone.

The importance of physiotherapy can be observed by the fact that respiratory disease treatments are also carried out by physiotherapeutic techniques e.g. coughing, vibration, cupped hand technique, clapping etc. involve the use of physiotherapeutic techniques frequently proving the importance of physiotherapy.

Whiplash is a condition due to vehicle accidents which may result in dizziness, numbness, pain in shoulder and neck muscles, ringing of bell in ear and such others.

Against even these the doctors prescribe physiotherapy which may involve different sorts of techniques to rehabilitate the patient back to normal. Accident victims can be quoted while talking about the importance of physiotherapy.

Some decades earlier when the physiotherapy was growing and thriving the doctors, healthcare professionals and patients used to distrust or be indecisive regarding the use of physiotherapeutic techniques but now-a-days physiotherapy has been recognized well practiced well accepted well and physiotherapy deserves to be so.

Physiotherapy is the most commonly prescribed treatment to assist in the recovery of many injuries and conditions. Chronic pain, car and sports injuries and challenges with mobility can all be greatly improved with the use of physiotherapy. Here are just a few reasons why sticking to your physiotherapy is so important:

Range of Motion

If you have suffered from an injury or have a condition that is affecting your range of motion, without physiotherapy you will continue to feel less and less capable of participating in your day to day activities. Stiffness and pain in your shoulder, for example, can lead to a case of frozen shoulder if you do not follow your physiotherapy plan. In Ottawa, physiotherapy patients with range of motion issues will regain their mobility and be able to return to their usual level of activity and better care for themselves.

Exercise

Your physiotherapist will assign a number of therapeutic exercises for you to practice at home between appointments. Many people think that once they are shown how to do the exercises they no longer require assistance from their physiotherapists. However, during your Ottawa physiotherapy appointments, your physiotherapist will first check your improvement and then can increase or change your exercises accordingly to match your progress. Sometimes they will reduce your exercises if you seem to be having difficulty. Without regular appointments chances are you will not be able to

progress to complete recovery and could even make matters worse.

Neurological Disorders

For patients who have suffered a stroke or have conditions such as Parkinson's Disease, physiotherapy plays a key role in aiding with correcting or improving the damage. Your treatments at an Ottawa physiotherapy clinic will help to compensate for deficits in gait, mobility and weaknesses, to bring back full or partial function, and to stop further deterioration from taking place.

Cardiopulmonary Conditions

If you suffer from breathing issues that are interfering with your day to day life, Ottawa physiotherapy patients have seen great improvements following guided exercises, in hand with exercises with a physiotherapist. Cardiac patients also receive instruction on basic movement to regain their confidence after surgery.

Pain Management

In any number of cases for both chronic pain or pain resulting from an accident or injury, physiotherapy will aid in pain management improving your quality of life so you can resume your daily activities, sports, and hobbies.

Why should you stick with your Physiotherapist?

Some people think that you only need to see your physiotherapist once and you are cured but realistically you should stick to all of their advice even if that means more then 1 appointment. Our Metro Physio team will explain in detail the importance of our treatment, what exercises you may need to do and how you are progressing throughout your treatments. You may not need as many appointments they advise you to have but it is always best to keep up with them to stop any further twinges etc.

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ELECTROTHERAPY

Electrotherapy is the use of electrical energy as a medical treatment. In medicine, the term electrotherapy can apply to a variety of treatments, including the use of electrical devices such as deep brain stimulators for neurological disease. The term has also been applied specifically to the use of electric current to speed wound healing. Additionally, the term "electrotherapy" or "electromagnetic therapy" has also been applied to a range of alternative medical devices and treatments.

It has not been found to be effective in increasing bone healing.

History

The first medical treatments with electricity in London have been recorded as far back as 1767 at Middlesex Hospital in London using a special apparatus. The same was purchased for St. Bartholomew's Hospital only ten years later. The record of uses other than being therapeutic is not clear, however Guy's Hospital has a published list of cases from the earlier 1800s.

Muscle Stimulation

In 1855 Guillaume Duchenne announced that alternating was superior to direct current for electrotherapeutic triggering of muscle contractions. What he called the 'warming affect' of direct currents irritated the skin, since, at voltage strengths needed for muscle contractions, they cause the skin to blister (at the anode) and pit (at the cathode). Furthermore, with DC each contraction required the current to be stopped and

restarted. Moreover, alternating current could produce strong muscle contractions regardless of the condition of the muscle, whereas DC-induced contractions were strong if the muscle was strong, and weak if the muscle was weak.

Since that time almost all rehabilitation involving muscle contraction has been done with a symmetrical rectangular biphasic waveform. During the 1940s, however, the U.S. War Department, investigating the application of electrical stimulation not just to retard and prevent atrophy but to restore muscle mass and strength, employed what was termed galvanic exercise on the atrophied hands of patients who had an ulnar nerve lesion from surgery upon a wound. These galvanic exercises employed a monophasic wave form, direct current.

Cancer Treatment

In the field of cancer treatment, DC electrotherapy showed promise as early as 1959, when a study published in the journal Science reported total destruction of tumor in 60% of subjects, which was very noteworthy for an initial study. In 1985, the journal Cancer Research published the most remarkable such study, reporting 98% shrinkage of tumor in animal subjects on being treated with DC electrotherapy for only five hours over five days. The mechanism for the effectiveness of DC electrotherapy in treating cancer was suggested in an article published in 1997. The free-radical (unpaired electron) containing active-site of enzyme Ribonucleotide Reductase, RnR—which controls the rate-limiting step in the synthesis of DNA—can be disabled by a stream of passing electrons.

Modern Use

Although a 1999 meta-analysis found that electrotherapy could speed the healing of wounds, in 2000 the Dutch Medical Council found that although it was widely used, there was insufficient evidence for its benefits. Since that time, a few publications have emerged that seem to support its efficacy, but data is still scarce.

The use of electrotherapy has been researched and accepted in the field of rehabilitation (electrical muscle

stimulation). The American Physical Therapy Association acknowledges the use of Electrotherapy for:

1. Pain management
   - Improves range of joint movement
2. Treatment of neuromuscular dysfunction
   - Improvement of strength
   - Improvement of motor control
   - Retards muscle atrophy
   - Improvement of local blood flow
3. Improves range of joint mobility
   - Induces repeated stretching of contracted, shortened soft tissues
4. Tissue repair
   - Enhances microcirculation and protein synthesis to heal wounds
   - Increased blood flow to the injured tissues increases macrophages to clean up debri
   - Restores integrity of connective and dermal tissues
5. Acute and chronic edema
   - Accelerates absorption rate
   - Affects blood vessel permeability
   - Increases mobility of proteins, blood cells and lymphatic flow
6. Peripheral blood flow
   - Induces arterial, venous and lymphatic flow
7. Iontophoresis
   - Delivery of pharmacological agents
   - DC (direct current) transports ions through skin
   - Common drugs used:
   - Dexamethasone
   - Acetic acid
   - Lidocaine
8. Urine and fecal incontinence
   - Affects pelvic floor musculature to reduce pelvic pain and strengthen musculature
   - Treatment may lead to complete continence
9. Lymphatic Drainage

INFRARED RAYS

Infrared (IR) is invisible radiant energy, electromagnetic radiation with longer wavelengths than those of visible light, extending from the nominal red edge of the visible spectrum at 700 nanometers (frequency 430 THz) to 1 mm (300 GHz) (although people can see infrared up to at least 1050 nm in experiments). Most of the thermal radiation emitted by objects near room temperature is infrared.

Infrared radiation was discovered in 1800 by

astronomer Sir William Herschel, who discovered a type of invisible radiation in the spectrum lower in energy than red light, by means of its effect upon a thermometer. Slightly more than half of the total energy from the Sun was eventually found to arrive on Earth in the form of infrared. The balance between absorbed and emitted infrared radiation has a critical effect on Earth's climate.

Infrared energy is emitted or absorbed by molecules when they change their rotational-vibrational movements. Infrared energy excites vibrational modes in a molecule through a change in the dipole moment, making it a useful frequency range for study of these energy states for molecules of the proper symmetry. Infrared spectroscopy examines absorption and transmission of photons in the infrared energy range.

INFRARED THERAPY

Far Infrared is the 'warm' energy in humans, animals and plants, also emitted from sunlight. The intensity of Far Infrared produced by the human body constantly fluctuates. When its intensity is high, we feel healthy and are able to overcome ailments. When the Far Infrared (FIR) begins to decline, we are subject to disease and illness and tend to age more quickly. We can be exposed to Far Infrared heat for hours and it will never cause our skin to burn. Far Infrared heat is completely healthy and safe for all living things.

The Evolution of Far Infrared Heat Therapy and the Technology Available Today.

What is Far Infrared therapy (FIR) and what does it do:

Far Infrared Ray are waves of energy, totally invisible to the naked eye, capable of penetrating deep into the human body, where they gently elevate the body's surface temperature (107.6F/42 celsius and above, enables destruction of cancer cells), and activate major bodily functions.

History—How Far Infrared therapy came into being:

Our bodies radiate far infrared energy through the skin at 3 to 50 microns, with most output at 9.4 microns. Our palms emit FIR energy also, between 8 and 14 microns. 'Palm Healing', an ancient tradition in China, has used the healing properties of far infrared rays for 3,000 years. These natural healers emit energy and heat radiating from their hands to heal, much the same as Reiki healers do. Current research conducted in Taiwan has measured significant far infrared energy emitted from the hands of Chi Gong masters. Yogis in India also employ palm healing and recommend it especially for relieving eye strain. Thermal therapy has in fact been in existence for thousands of years, dating back to ancient civilizations such as the Finns, the Romans, the ancient Chinese and the American Indians.

Sunshine:

Since ancient times, people have believed that exposure to sunshine can maintain and even enhance health. Sun therapy is a form of natural FIR thermal therapy. Far Infrared Ray are the invisible rays of natural sunlight that have the longest wavelength. However, sunbathing should only be enjoyed in moderation since sunlight contains ultra-violet ray which can burn the skin. There is also no temperature control and sunshine is only available seasonally.

ULTRAVIOLET RAYS

Ultraviolet (UV) light is an electromagnetic radiation with a wavelength from 10 nm (30 PHz) to 380 nm (750 THz), shorter than that of visible light but longer than X-rays. UV radiation is present in sunlight, and also produced by electric arcs and specialized lights such as mercury-vapor lamps, tanning lamps, and black lights. Although lacking the energy to ionize atoms, long-wavelength ultraviolet radiation can cause chemical reactions, and causes many substances to glow or fluoresce. Consequently, biological effects of UV are greater than simple heating effects, and many practical applications of UV radiation derive from its interactions with organic molecules.

Suntan, freckling and sunburn are familiar effects of over-exposure, along with higher risk of skin cancer. Living things on dry land would be severely damaged by ultraviolet radiation from the sun if most of it were not filtered out by the Earth's atmosphere. More-energetic,

shorter-wavelength "extreme" UV below 121 nm ionizes air so strongly that it is absorbed before it reaches the ground. Ultraviolet is also responsible for the formation of bone-strengthening vitamin D in most land vertebrates, including humans. The UV spectrum thus has effects both beneficial and harmful to human health.

Near-UV light is visible to some insects, mammals, and birds. Small birds have a fourth color receptor for ultraviolet light; this gives birds "true" UV vision. Reindeer use Near-UV light to see polar bears; which would be invisible in regular light because they blend in with the snow. UV light also allows mammals to see urine trails, which is helpful for prey animals to find food in the wild. The males and females of some butterfly species look identical to the human eye but very different to UV-sensitive eyes—the males sport bright patterns in order to attract the females Most Ultraviolet rays are invisible to most humans: the lens on a human eye ordinarily filters out UVB frequencies or lower, and humans lack color receptor adaptations for ultraviolet light, so humans don't see many of the "light or colours" certain animals see.

Under some conditions children and young adults can see ultraviolet down to wavelengths of about 310 nm, and people with aphakia (missing lens) or replacement lens can also see some UV wavelengths. People who don't have lenses often report seeing ultraviolet light that looks "whitish blue" or "whitish violet". This happens because our three color receptors (red, green and blue) are all sensitive to ultraviolet light, so the light comes in as a mixture of the three receptors, with a slight nod to blue side of the spectrum.

Discovery

"Ultraviolet" means "beyond violet" (from Latin ultra, "beyond"), violet being the color of the highest frequencies of visible light. Ultraviolet light has a higher frequency than violet light.

ULTRAVIOLET LIGHT THERAPY

Ultraviolet light therapy or ultraviolet phototherapy is a form of treatment for certain skin disorders including atopic skin disorder and vitiligo when used with psoralen to form the PUVA treatment. It consists of irradiation of the patient with the UVA band of ultraviolet light (fairly closely matching the ultraviolet output from the sun), usually delivered from a fluorescent bulb specially designed to output this frequency of ultraviolet.

SHORT WAVE DIATHERMY

In medicine, the term diathermy [di´ah-ther?me] means "electrically induced heat" the use of high-frequency electromagnetic currents as a form of physical or occupational therapy and in surgical procedures. The field was pioneered in 1907 by German physician Karl Franz Nagelschmidt, who coined the term diathermy, derived from the Greek words dia and therma, and literally means "heating through." adj., adj diather´mal, diather´mic.

ULTRASONIC RAYS TREATMENT

Ultrasound is another modality that physical therapists can use to help a patient with their pain. Ultrasound is essentially a machine that uses sound waves to generate heat within a body part. What the therapist will do with the patient is use a sound head or something that you would see similar in a doctor's office where they do sonograms on pregnant women, and they put a little gel on the sound head and your body part. And, in a circular motion, we just rub the sound head on, say, your shoulder joint, and what that will do is generate heat in that joint, which will help with overall blood flow circulation. It will also help loosen up tissues to allow them to respond better to stretch or any other manual techniques that the therapist will be using such as to loosen up tight joints or tight muscles. It also helps prepare the body part for just general activity before an exercise program. Ultrasound can also be helpful in acute injuries for non-thermal effects, meaning no heat is generated, but it can help increase blood flow so that way inflammation or swelling can be reduced.

CRYOTHERAPY

Cryotherapy is the local or general use of low temperatures in medical therapy. Cryotherapy is used to treat a variety of benign and malignant tissue damage, medically called lesions. The term "cryotherapy" comes from the Greek cryo meaning cold, and therapy eaning cure. Cryotherapy has been used as early as the seventeenth century.

Its goal is to decrease cell growth and reproduction (cellular metabolism), increase cellular survival, decrease inflammation, decrease pain and spasm, promote the constriction of blood vessels (vasoconstriction), and when using extreme temperatures, to destroy cells by crystallizing the cytosol, which is the liquid found inside cells, also known as intracellular fluid (ICF). The most prominent use of the term refers to the surgical treatment, specifically known as cryosurgery. Other therapies that use the term are whole-body cryotherapy and ice pack therapy.

Hyperbaric Gaseous Cryotherapy

In 1993, Christian Cluzeau developed the hyperbaric gaseous cryotherapy also called NeuroCryoStimulation or NCS that can immediately relieve pain by acting on four physiological effects:

- Painkiller
- Vasomotor
- Anti-inflammatory

• Muscle relaxation

This technique, practiced by some doctors, physiotherapists and veterinarians consists in applying for a short time on the skin up to the painful area, carbon dioxide at -78.3 °C (-109 °F) with a pressure of 5.0 MPa (50 bar) and a frequency of 400 Hz. Sessions can be repeated at will. Unlike ice packs, the usage of carbon dioxide does not produce pain. Even if not as dangerous as liquid nitrogen used in cryosurgery, the low temperature could cause burns.

Cryosurgery

Cryosurgery is the application of extreme cold to destroy abnormal or diseased tissue. Cryosurgery is used to treat a number of diseases and disorders, most especially skin conditions like warts, moles, skin tags and solar keratoses. Liquid nitrogen is usually used to freeze the tissues at the cellular level. The procedure is used often because of its efficacy and a low rate of side effects.

Ice Pack Therapy

Ice pack therapy is a treatment of cold temperatures to an injured area of the body. An ice pack is placed over an injured area and is intended to absorb heat of a closed traumatic or edematous injury by using conduction to transfer thermal energy. The physiologic effects of cold application include immediate vasoconstriction with reflexive vasodilation, decreased local metabolism and enzymatic activity, and decreased oxygen demand. Cold decreases muscle spindle fiber activity and slows nerve conduction velocity, therefore it is often used to decrease spasticity and muscle guarding. It is commonly used to alleviate the pain of minor injuries, as well as decrease muscle soreness. The use of ice packs in treatment decreases the blood flow most rapidly at the beginning of the cooling period, this occurs as a result of vasoconstriction, the initial reflex sympathetic activity. As stated previously, ice is a very popular modality for treatment in injuries and muscle repair following any activity, however the application of cold prior to activity is also an option, and is often used in sports medicine.

THERMO THERAPY

Thermotherapy consists of application of heat or cold (cryotherapie) for the purpose of changing the cutaneous, intra-articular and core temperature of soft tissue with the intention of improving the symptoms of certain conditions. Cryotherapy and thermotherapy are useful adjuncts for the treatment of musculoskeletal injuries and soft tissue injuries. Using ice or heat as a therapeutic intervention decreases pain in joint and muscle as well as soft tissues and they have opposite effects on tissue metabolism, blood flow, inflammation, edema and connective tissue extensibility. Thermotherapy can be

used in rehabilitation facilities or at home.

Osteoarthritis (OA) is the most common form of arthritis that can affect the hands, hips, shoulders and knees. In OA, the cartilage that protects the ends of the bones breaks down and causes pain and swelling. Thermotherapy involves applying heat or cold to joints to improve the symptoms of osteoarthritis and can be done with packs, towels, wax, etc. Heat may work by improving circulation and relaxing muscles, while cold may numb the pain, decrease swelling, constrict blood vessels and block nerve impulses to the joint. Thermotherapy can be used in rehabilitation programmes or at home.

How well does thermotherapy work?

One study showed that massaging with ice for 20 minutes, 5 days a week for 2 weeks, improved muscle strength in the leg, the range of motion in the knee and decreased time to walk 50 feet compared to no treatment.

Another study showed that ice packs for 3 days a week for three weeks improved pain just as well as no treatment.

Another study showed that cold packs for 20 minutes for 10 periods decreased swelling more than no treatment. Hot packs for the same amount of time had the same effect on swelling as no treatment.

How safe is it?

No side effects were reported in the studies, but in general, studies report that thermotherapy is safe when applied carefully.

What is the bottom line?

Since the studies were small and of low quality firm conclusions cannot be made. There is "silver" level evidence that ice massage could be used to improve range of motion and strength of the knee and function in people with osteoarthritis of the knee. Cold packs may be used to decrease swelling.

Purpose of Thermotherapy

The goal of thermotherapy is to alter tissue temperature in a targeted region over time for the purpose of inducing a desired biological response. The majority of

thermotherapies are designed to deliver the thermal therapy to a target tissue volume with minimal impact on intervening or surrounding tissues.

Heat: By increasing the temperature of the skin/soft tissue, the blood flow increases by vasodilatation. The metabolic rate and the tissue extensibility will also increase. Heat increases oxygen uptake and accelerates tissue healing, it also increases the activity of destructive enzymes, such as collagenase, and increases the catabolic rate.

Cold: By decreasing the temperature of the skin/soft tissue, the blood flow decreases by vasoconstriction. It will be followed afterwards by a vasodilatation which will prevent against hypoxic damage (hunting reflex: If the cold pack is left on the skin for more than 10 minutes, the blood vessels will dilatate). The tissue metabolism will decrease just like the neuronal excitability, inflammation, conduction rate and tissue extensibility. At joint temperatures of 30°C or lower, the activity of cartilagedegrading enzymes, including collagenase, elastase, hyaluronidase, and protease, is inhibited. The decreased metabolic rate limits further injury and aids the tissue in surviving the cellular hypoxia that occurs after injury.

Both applications can reduce the pain, but when we need to use which application is still the question. Therefore, patient's preference can be taken into consideration when deciding which thermotherapy tool to use.

WHIRLPOOL BATH

The immersion of the body or a part of the body in a tank of warm water agitated by a jet of equally hot water and air, often used to clean infected wounds.

A therapeutic stainless steel, fiberglass, or plastic tank that uses turbines to agitate and aerate water into which the body, or part of it, is immersed. Tanks come in various sizes to accommodate treatment of different body parts (Hubbard and "low boy" tanks for full-body treatments or extremity tanks for arm or leg treatments). Water

temperature selection varies depending on the condition of the patient and the desired therapeutic outcome. Cold whirlpools (ranging from 50°–79°F) are useful in treating acute inflammation. Tepid whirlpools (79°–92°F) are used to facilitate early therapeutic exercise. Neutral temperatures (92°–96°F) are generally indicated for treatment of wounds or for patients who have circulatory, cardiac, or sensory disorders or neurological changes in muscle tone. Hot whirlpools (99°–110°F) are beneficial in relieving pain, increasing soft tissue extensibility, and treating chronic conditions such as arthritis. In general, whirlpool temperatures should not exceed 110° to 115°F because of risk of burns.

If you have an injury that causes a loss of normal functional mobility, you may be referred to physical therapy by your doctor. Your physical therapist will then begin the process of treating your injury and helping you return to normal function.

There are many different treatment options and modalities available in physical therapy. Some of these treatments are aimed at decreasing pain or swelling, and some are used to help improve strength, range of motion, or mobility.

The whirlpool is one physical therapy treatment that you may encounter.

Goals of Whirlpool Therapy

The typical goals of whirlpool use in the physical therapy clinic include:

- Decrease swelling
- Control inflammation
- Promote wound healing
- Improve motion
- Decrease pain
- Decrease muscle spasm

If your physical therapist decides to treat your injury with whirlpool therapy, be sure to ask plenty of questions about your treatment. Make sure you understand what the goals of the treatment are and what you should expect from the whirlpool treatment.

treated.

Common Conditions That May be Treated with Whirlpool Therapy

Common injuries and conditions that may be treated with whirlpool therapy include:

- Ankle fracture
- Plantar fasciitis
- Lisfranc dislocation
- Colles' and Smith's fractures
- Ankle sprain
- Tennis elbow
- Achilles tendon rupture and tendinitis

Of course, this is just a short list of conditions that may benefit from whirlpool therapy. Just about any body part can be treated with whirlpool therapy, as long as it can be placed in the whirlpool.

Whirlpools can also be used in the treatment of wounds. If you have had surgery, you may have a surgical scar with scabbing on it. You may also have a wound that needs to be debrided, or cleaned. Your physical therapist may use the spinning action of the whirlpool to help clean out your incision or wound. Treatment after the whirlpool for wound care involves applying the correct dressing to ensure appropriate healing continues.

If you have suffered an injury and require physical therapy, you may have the opportunity to experience a whirlpool treatment. Remember that whirlpool therapy should be only one component to a rehabilitation program. Most research indicates that passive treatments, such as whirlpools, may be helpful, but exercise and mobility are best to help improve function. By working closely with your doctor and physical therapist, you can be sure to safely and quickly get back to normal mobility.

STEAM BATH

A steambath is a steam-filled room for the purpose of relaxation and cleansing. It has a long history, going back to Greek and Roman times.

The origins of the steam bath come from the Roman bath, which began during the height of the Roman Empire. Ancient Roman baths served many community

and social functions within Roman society. Everyone in Rome used Roman public baths, regardless of socioeconomic status. These Roman baths were supplied by natural hot springs from beneath the ground.

Historical parts of a spa – Roman, medieval, Georgian and Victorian have been restored in Bath, England and is available as a public bath or Thermae.

Steam baths provide a variety of health and beauty benefits, suitable for almost anyone. Warm, moist heat supplies sink in to the skin, joints and muscles. The skin first responds by opening the pores, cleaning several layers deep into the dermis. Perspiration carrying the body's toxins can seep out of the enlarged pores with ease. The body reacts by relaxing sore muscles and improving blood flow, bringing more oxygen and nutrients to all areas of the body, even the most delicate capillaries. A steam bath---also called steam shower, hot springs, sweat lodge, wet sauna, hydrotherapy and hot bath---is safe and beneficial for almost every age and medical condition.

How often you should take a steam bath is a personal matter for most. History gives hints. Since early civilization, societies used steam baths for a variety of reasons, particularly for health and beauty benefits, but also for social interaction too. The earliest use of steam bathing occurred in prehistoric times. Humans used the steam vapors that oozed from the earth's volcano cracks for cleansing and healing the sick and incurable. Later, in ancient Rome, public baths, supported by natural hot springs, were open all Romans, regardless of the social class. Bathers enjoyed wrestling and dancing in the baths, often throughout the day, taking breaks periodically to cool down before reentering.

In colonial times, Benjamin Franklin used to take a daily steam bath by an open window. He believed that every illness or disease could evaporate through the skin, once the pores are open and exposed to fresh air. For an hour after a morning steam bath, he exposed his unclothed skin to the fresh outdoor air. During colonial times, a weekly hot bath with plenty of steam was a remedy for typical medical alignments.

Today, not much has changed. Steam baths are both private and semi-private enterprises, promoting health and relaxation, provided by fitness centers, spas and wellness clinics. Steam vapors, provided by a hot bath at home, give you the same health and beauty benefits as the commercial grade versions. Health personnel—from personal trainers to cardiologists—recommend a weekly regular steam bath.

Modern Steam Baths

Today, natural steam baths still exist, and often still use similar systems that the Romans used, which contain pipes and pumps that bring water up and into the large pool areas, wherever the natural springs exist. Heaters are also now used to maintain warm temperatures in the baths.

There are many different types of steam baths, which are different from saunas. (Both are hot, but the steam in a sauna is created by throwing water on a stove.)

Turkish baths, steam rooms and steam showers are types of steambath.

Who Can Use a Steam Bath?

Most healthy adults can take a weekly steam bath for routine cleansing and relaxation but may opt for one per day. Sometimes athletes and other fitness enthusiasts, take a steam bath before and after a workout. Those who have acne, sore muscles and joints, depression, anxiety and arthritis are among the bathers who may take up to two per day, unless a doctor advises otherwise.

For those under 13 or those over 65 years of age, take a weekly steam bath, unless your doctor recommends otherwise. Do not give an infant or toddler a steam bath without talking to a pediatrician first. If you are over 65 or have a physical disability, use an auxiliary aid or have someone to assist you in and out of the steam bath or bathtub if needed.

SAUNA BATH

A sauna is a small room or building designed as a place to experience dry or wet heat sessions, or an establishment with one or more of these facilities. The steam and high heat make the bathers perspire. Saunas can be divided into two basic types: conventional saunas that warm the air or infrared saunas that warm objects. Infrared saunas may use a variety of materials in their heating area such as charcoal, active carbon fibers, and other materials.

Originally borrowed from the early Proto-Germanic *stakna- whose descendants include English stack, the word sauna is an ancient Finnish word referring to the traditional Finnish bath and to the bathhouse itself. In Baltic-Finnic languages other than Finnish, sauna does not necessarily mean a building or space built for bathing. It can also mean a small cabin or cottage, such as a cabin for a fisherman

Saunas and steam baths are hyperthermic procedures earning a special place in balneology. They

are meant for the healthy, rather than the sick, their purpose being prevention of disease and physical strengthening.

Sweat baths were very popular in central and eastern Europe among the Slavs. The popularity of sweat baths spread to the west, where they appeared in German and Swiss villages. Heat was produced in a live place where water was cast on heated stoves. People rubbed their skin with scarves and whipped themselves with birch or oak branches to produce a hyperemia of the skin. The procedure was ended by a cold drenching, a cold bath, or by lying in some cool place.

Arab and Turkish baths developed from Roman baths. After sweating had been induced, running water was poured on the body. The pools, exercises, and gymnastics used by the Romans were not as common. After Napoleon's Roman campaign in the second half of the 19th century, sweat baths spread throughout Europe from France. In 1856, an Irish physician installed the first "Roman Irish" (or "Turkish") Bath in York, Ireland; they were hot air baths with cold and warm showers. The heat baths of Japan are not taken for cleansing, as washing with soap and going for a swim precede the bath, but as treatment for rheumatism.

MASSAGE: HISTORY

The practice of using touch as a healing method derives from customs and techniques rooted in ancient history. Civilizations in the East and West found that natural healing and massage could heal injuries, relieve pain, and prevent and cure illnesses. What's more, it helped reduce stress and produce deep relaxation.

Massage therapy began as a sacred system of natural healing. However, cultural shifts rendered it a disreputable form of indulgence for extensive periods of history. Enduring these turns, massage has experienced resurgence in modern times. Today, massage therapy stands as a highly respected holistic healing method practiced across the world. Here's how massage has evolved into the relaxing and therapeutic practice it is today:

A Form of Massage Emerges in India

Started practicing massage in approximately 3,000 BCE*, possibly earlier

Believed to be of divine origin and passed down orally through generations, Ayurveda is the traditional holistic medical system in India. Ancient seers and natural scientists developed this system based on centuries of studies, experiments and meditations.

Texts detailing Ayurvedic principles and practices were written some time between 1500 and 500 BCE. Based on these texts, Ayurveda was widely adopted throughout India and Southeast Asia.

Ayurveda views that individuals incur illnesses and diseases when they live out of harmony with their

environment. To treat their conditions, individuals must restore their natural mental and physical balance by reestablishing harmony between themselves and the world around them. At that point, they can begin to heal naturally.

Based on the patient's health imbalances, constitution and the time of year, Ayurveda recommends how to use the five senses to interact with the environment in order to create balance. Treatments in Ayurveda include diet and herbalism, aromatherapy, color therapy, sound therapy and touch therapy.

A Hint of the Massage Culture Appears in Egypt and China

Started practicing massage between 3000 and 2500 BCE

The earliest written records of massage therapy were discovered in Egypt and China. Tomb paintings in Egypt depict individuals being kneaded by others. Furthermore, Egyptians are credited with creating reflexology in approximately 2500 BCE. In this system, the practitioner applies pressure to specific points or reflex zones on the feet and hands. In turn, the recipient experiences beneficial effects on the areas of the body that connect to those zones.

In China, texts documenting the medical benefits of massage therapy date back to approximately 2700 BCE. The Chinese tradition of massage therapy was developed from the combined expertise and methods of doctors in traditional Chinese medicine, practitioners of martial arts, Buddhists and Taoists who viewed touch as essential to their spiritual yoga training, and laymen who offered massages for relaxation.

Chinese massage methods originated from the principle that diseases and illnesses arise due to a deficiency or imbalance in the energy in specific pathways or meridians that represent physiological systems. Through massage and other specific bodywork techniques, energy will flow more harmoniously through these pathways, allowing the body to heal itself naturally.

Techniques include Tui Na, amno, acupuncture and

acupressure, to name a few. Practitioners may complement massage treatments with herbal remedies, dietary therapy and exercise recommendations.

Monks Bring Massage Therapy to Japan

Started practicing massage in approximately 1000 BCE

Starting around 1000 BCE, Japanese monks studying Buddhism in China observed the healing methods of traditional Chinese medicine, including massage therapy. Japan soon began to import and customize Chinese massage techniques, giving rise to traditional Japanese massage or anma, which grew into Shiatsu.

The primary goal of Shiatsu is to raise the energy level in the patient. In turn, this increased energy level regulates and fortifies the functioning of the organs and stimulates natural resistance to illnesses.

Massage practitioners stimulate pressure points in the body in an effort to rebalance the patient's energy. They use their thumbs, fingers and palms, working without needles or other instruments. Through treatment, patients can achieve balance in both their physical body and emotional well-being.

Athletes and Philosophers Introduce Massage to Greece

Started practicing massage between 800 and 700 BCE

Derived from the Eastern philosophies and practices, massage progressed into Western civilization in approximately the eighth century BCE.

Athletes in Ancient Greece employed massage to keep their bodies in peak condition prior to competitions. Physicians of the time used herbs and oils in combination with massage techniques to treat many medical conditions. Greek women recognized the benefits of these aromatic oils and used them as beauty treatments on their skin.

to loosen and relax the muscles. The sides of the hand, and any part of the hand such as the tips or heel can be used by the masseuse to shake up the muscles of the person.

PHYSIOLOGICAL EFFECT OF MASSAGE

There are many therapeutic approaches in the massage as well. However according to the historical development of massage, most of the massage approaches are conveniently categorized into Eastern and Western traditions. With exceptions, the main thrust of the Western tradition is on the use of mechanical means for intervention in the musculoskeletal and peripheral vascular system, whereas the Eastern tradition mainly emphasizes to affect the neurology system. Certain special massage techniques like "Reflex Zone Massage" or "Connective tissue Massage" have also developed after discovering that deep massage over one part of the body could have distinct observable favourable effects on body parts distant from the part being (2) treated, and a disorder in peripheral or visceral structures could be treated by applying massage to the muscle or connective tissue having the same segmental distribution. However, it can be summarized that despite wide variety of forms of massage therapy prevailing, and all of them having their own theoretical or philosophical perspectives, certain basic underlying principles common to all types of massage forms are briefly described here under. The effects produced largely depend whether the massage is localized or generalized, and also on its intensity and duration.

Circulation of Blood : Perhaps the most important basic principle in the filed is that improved blood circulation is beneficial for virtually all health conditions. Tension in the muscles and other soft tissues can impair circulation resulting in a deficient supply of nutrients and inadequate removal of wastes or toxins from the body tissues. This in turn can lead to illness, structural and functional problems or slower healing. Therefore, the restoration of normal blood circulation through massage is very important to promote healing.

Movement of lymph : The lymphatic system is almost as extensive as that of the blood. The circulation of lymphatic fluid plays a key role in getting rid off the wastes, toxins and pathogens from the body. The lymph system also benefits from massage, particularly in conditions where lymphatic flow system also benefits from massage, particularly in conditions where lymphatic flow is impaired by injury disease or surgery.

Release of Toxins : Chronic tension or trauma to the soft tissues of the body can result in the building of toxic by-products of normal metabolism. Massage techniques help move the toxins through the body's normal pathways of release and removal.

Release of Tension : Chronic muscular tension accumulates as a result of high stress life styles, or trauma and can impair body's structure and function. Psychological well-beingness is also affected. Release of tension allow greater relaxation, which has very important physiological and psychological benefits.

Structure and Function are Interdependent : The musculoskeletal structure of the body affects function, and function affects structure. Both structure and function can be adversely altered by stress or trauma. Massage therapy can help restore healthy structure and function, and thereby allowing better circulation, greater case and range of movement, more flexibility, and the release or chronic patterns of tension.

Enhancement of All Bodily Systems: All bodily systems are affected by better circulation and more harmonious functioning of the musculature and other soft tissues, Internal organ systems, the nervous system, immune system and all other systems can benefit with the properly selected massage techniques and there can be an overall improvement in the quality of life and physical health. The effect of massage on various Reflex Zones, and therefore, its influence on various aspects of body.

Mind Body Integration : Mind and body have a reciprocal relationship. Soma (body) affects psyche (mind) and vice-versa. There can be psychosomatic effects in

which psychological or emotional conditions affect the body likewise, there can be somatopsychic effect in which (3) the conditions of the body affect the mind and emotions. Change in one domain may cause change in the other. Quite often massage and psychotherapy used in combination achieves good benefits in such conditions.

Redaction of Stress : It is believed that perhaps 80-90% of all illness and diseases are stress induced. And with the increasing stressful life style in the modern times, massage therapy offers an effective, non-drug method for reducing stress and promoting relaxation.

According to Joanna Chieppa, an energy healing practitioner and senior faculty member at Heartwood Institute in Garbeville, California (USA). "It is important for people to develop an awareness that the flow of energy in and around the body is just important to well-being as the flow of blood, the flow of breath, the flow of cerebrospinal fluid is essential for the health of body, mind and spirit". There are certain specialized massage procedures and body work systems that regulate the flow of energy through the body as a means to promote healing. Energy can be directed or encouraged to move through and around the body in such ways as to have impact on the physical structure and function of the body as well as on emotional well-beingness.

DEFINITION OF THERAPEUTIC EXERCISE

DeLateur defined therapeutic exercise as bodily movement prescribed to correct an impairment, improve musculoskeletal function, or maintain a state of well-being. It may vary from highly selected activities restricted to specific muscles or parts of the body, to general and vigorous activities that can return a convalescing patient to the peak of physical condition. Therapeutic exercise seeks to accomplish the following goals:

- Enable ambulation
- Release contracted muscles, tendons, and fascia
- Mobilize joints
- Improve circulation
- Improve respiratory capacity
- Improve coordination
- Reduce rigidity
- Improve balance
- Promote relaxation
- Improve muscle strength and, if possible, achieve and maintain maximal voluntary contractile force (MVC)
- Improve exercise performance and functional capacity (endurance)

The last 2 goals mirror an individual's overall physical fitness, a state characterized by good muscle strength combined with good endurance. No matter which types of exercise may be needed initially and are applied to remedy a patient's specific condition, the final goal of rehabilitation is to achieve, whenever possible, an optimal level of physical fitness by the end of the treatment regimen.

Types of Therapeutic Exercise

Therapeutic exercises aimed at achieving and maintaining physical fitness fall into the following major categories:

- Endurance training
- Resistance training
- Flexibility training

SCOPE OF THERAPEUTIC EXERCISE

Therapeutic exercises refers to a wide range of physical activities that focuses on restoring and maintaining strength, endurance, flexibility, stability and balance. The goal of therapeutic exercises is to return an injured patient to a fully functioning, pain-free state.

A physical therapist begins by conducting a thorough evaluation of an individual's physical capabilities through both a medical history and physical assessment. The physical therapist then uses his/her knowledge to shape a treatment care plan containing a slowly-progressing exercise program that is appropriate to each individual's needs. The physical therapist monitors progress, assists with some physical movements and continuously modifies the plan as the client recovers.

The first objective of therapeutic exercise is to help the body reduce pain and inflammation. Once this is achieved, the exercise program focuses on regaining range of motion and rebuilding muscle strength and endurance. Exercises that may be included in a therapeutic program include:

- Strengthening exercises, usually performed with heavy resistance and fewer repetitions.
- Endurance exercises that engage large muscle groups over a longer period of time.
- Flexibility exercises achieved through stretching and movement.
- Balance and coordination exercises that focus on maintaining an individual's center of gravity.

PERMITTED PRACTICE

(a) Physical therapy is presumed to include any acts, tests, procedures, modalities, treatments, or interventions that are routinely taught in educational programs or in continuing education programs for physical therapists

and are routinely performed in practice settings.

(b) A physical therapist who employs acts, tests, procedures, modalities, treatments, or interventions in which professional training has been received through education or experience is considered to be engaged in the practice of physical therapy.

(c) A physical therapist must supervise physical therapist assistants, physical therapy aides, PT students and PTA students to the extent required under the Physical Therapy Practice Act and the rules in this Chapter. Physical therapy aides include all non-licensed individuals aiding in the provision of physical therapy services.

(d) The practice of physical therapy includes tests of joint motion, muscle length and strength, posture and gait, limb length and circumference, activities of daily living, pulmonary function, cardio vascular function, nerve and muscle electrical properties, orthotic and prosthetic fit and function, sensation and sensory perception, reflexes and muscle tone, and sensorimotor and other skilled performances; treatment procedures such as hydrotherapy, shortwave or microwave diathermy, ultrasound, infra red and ultraviolet radiation, cryotherapy, electrical stimulation including transcutaneous electrical neuromuscular stimulation, massage, debridement, intermittent vascular compression, iontophoresis, machine and manual traction of the cervical and lumbar spine, joint mobilization, machine and manual therapeutic exercise including isokinetics and biofeedback; and training in the use of orthotic, prosthetic and other assistive devices including crutches, canes and wheelchairs. Physical therapy further includes:

(1) Examining (history, system review and tests and measures) individuals in order to determine a diagnosis, prognosis, and intervention within the physical therapist's scope of practice. Tests and measures include the following:

(A) Aerobic capacity and endurance;

(B) Anthropometric characteristics;

(C) Arousal, attention, and cognition;
(D) Assistive and adaptive devices;
(E) Community and work (job/school/play) integration or reintegration;
(F) Cranial nerve integrity;
(G) Environmental, home, and work (job/school/play) barriers;
(H) Ergonomics and body mechanics;
(I) Gait, locomotion, and balance;
(J) Integumentary integrity;
(K) Joint integrity and mobility;
(L) Motor function;
(M) Muscle performance;
(N) Neuromotor development and sensory integration;
(O) Orthotic, protective and supportive devices;
(P) Pain;
(Q) Posture;
(R) Prosthetic requirements;
(S) Range of motion;
(T) Reflex integrity;
(U) Self-care and home management;
(V) Sensory integrity; and
(W) Ventilation, respiration, and circulation.

(2) Alleviating impairment and functional limitation by designing, implementing, and modifying therapeutic interventions that include the following:
(A) Coordination, communication and documentation;
(B) Patient/client-related instruction;
(C) Therapeutic exercise (including aerobic conditioning);
(D) Functional training in self-care and home management (including activities of daily living and instrumental activities of daily living);
(E) Functional training in community and work (jobs/school/play) integration or reintegration activities (including instrumental activities of daily living, work hardening, and work conditioning);
(F) Manual therapy techniques (including mobilization

PRINCIPLES OF THERAPEUTIC EXERCISE

Therapeutic exercise concerns the whole man and particularly his nervous system, as well as his joints, ligaments, and muscles. It should be exhibited, if not as accurately, then as least as validly as digitalis.

Physiotherapists, whose valuable proper role, stressed by the experts, should no more be required to determine treatment that the pharmacist should be asked to digitalise a patient. Of course, the informed and experienced physiotherapist, as the informed and experienced pharmacist, may indeed be more competent to determine a facet of treatment than an untaught doctor. However, most physiotherapists desire the benefit of expert medical supervision for themselves and for their patients; and indeed, the particular possibilities just mentioned leave the validity of our general contention unimpaired.

The net result of any invalid physical therapy must always be, at the very least, the summation of wasted time, money and effort, as well as the perpetuation of a form of medical practice that is surely as artless as it is unscientific.

The opportunity is available to discuss briefly only

some aspects of therapeutic exercise, and to do so, it is appropriate to consider, in turn, joints, ligaments and muscles.

JOINTS

Joints may be:

(a) Normal, mechanically and otherwise (for example, early multiple sclerosis).

(b) Abnormal mechanically (usually for traumatic or for developmental reasons, or from quiescent arthritis of one form or another).

(c) Unsound (when synovial reactions occur unless the joint is at rest).

The synovial reactions are subjective pain of significant degree during or shortly after exercise, periarticular swelling or redness, localized tenderness, and increased synovial fluid with a certain cellular content. The old maxim, "rest the unsound joint," has a modern basis following the work of Ropes and Bauer, and others. Supervision must ensure that exercise does not cause these reactions.

We may recollect one important anatomical consideration—that in joints transmitting pressure, risk of overloading occurs in extreme positions, for cartilage is thickest in most weight-bearing parts usually in the centre of ranges of motion. Supervision prevents risk of damage from this source.

LIGAMENTS

Ligaments are intended for weight-bearing of only short duration. Intermittent forces promote their growth and strength. Shortened ligaments of any but an unsound joint can be stretched by force. The ideal force is one of unusual duration and safe magnitude, applied when the part is warm, applied gradually, and in some cases, preferably when the patient is asleep, with the antagonists most relaxed. Examples of this form of stretching are the "Spastic Centre" night-splint for a tight tendo-achilles in spastic hemiplegia; and the standing-table, which offers standing for graduated periods, is of great value as one of the conservative measures available in attempting to control spasm in certain types of spastic paraplegia.

Another example is the reduction of hip flexion contracture, which is brought about in the double above-knee amputee using Rocker Pegs.

Where ligaments have become shortened, as sometimes happens after immobilization following injury around a joint, the safest stretching force is the patient's own active motor power.

MUSCLE

The Concept of Passive Elastic Tension

Striated muscles in resting positions are always stretched a little beyond the length of equilibrium. The force which they thus possess is termed "passive elastic tension." (Clemmeson).

Factors which influence this force are said to include changes in proportion and amount of sarcoplasm, as through hypertrophy and disuse; and the blood and lymph supply.

The balance of passive forces determines resting positions.

Hypertonus

"The muscle spindle is the peripheral endorgan through which facilitatory and inhibitory mechanisms produce and maintain rigidity".

Experience indicates that hypertonus may be reducible by piolonged splinting of the muscles concerned in an adequately lengthened state, an hypothesis being that the sensory part of the spindle is rendered insensitive.

The role of the muscle spindle, and the concept of neuronal circuits which are constantly active, has been elaborated not so long ago by Merton (1956) and others, and summarized recently by Kremer (1958).

EFFECTS OF THERAPEUTIC EXERCISE

Therapeutic exercise is not just an exercise, it is a structured and dosage specific physical activity. Exercise is being used simultaneously with drugs and it has been observed to have influence on the pharmacokinetic of drugs. Similarly, most individual utilizes both exercise and drugs to maintain good health and physical fitness. Exercises and drugs play important roles in control of pain, obesity, weakness, protection against degenerative diseases, improving cardiovascular endurance and respiratory efficiency. Just like drugs, it stimulates a healing response that couples both inflammatory and antiinflammatory mechanisms to repair, regenerate, and

grow stronger tissues. There are evidences that both drugs and exercise play the same roles in some diseases; hence, there is likelihood of interactions in the physiological responses of the body. Exercise is accessible, safe, and an inexpensive anti-inflammatory medicine and it also has web-like interactions in the body unlike drugs that has a single targeted action. Physiotherapists utilize exercises in the management of conditions such as osteoarthritis, stroke, hypertension, diabetes and cardiac diseases; and most of the subjects are equally on drugs. This review showed that exercises affect pharmacokinetic variables of drugs resulting in either positive or negative influence depending on the type of drugs, exercises intensity, duration and excretory organ.

CLASSIFICATION OF THERAPEUTIC EXERCISE

Therapeutic exercises are movements meant for healing and restoration of health. Its dosage, repetition is considered in respect of the condition of the patient, age, sex, climate etc.

Therapeutic movements are classified according to their nature as under:

(i) Passive - Here major role is played by the therapist.

(a) Relaxed Passive

Only up to the possible range of relaxation or the existing range at the moment.

(b) Forced Passive

To extend the range further.

(c) Assistive Passive

The patient also contributes a little.

(ii) Assistive

The patient can perform but still needs assistance. Assistance is provided by therapist or another person or through pulleys, elastic band etc. i.e., mechanical assistance.

(iii) Active

When the patient himself can perform.

(iv) Resistive

Resistance is applied to build power. This can be done with the help of equipment, with the help of the therapist, and also with the help of some other body parts of the patient.

It gives strength, power, endurance and range of

movements. Pulleys are sometimes used for applying resistance. To avoid gravitational force, some times exercises are performed under water to utilize the effect of buoyancy.

Static exercises sometime produce more physiological effect.

Resistive exercises

When exercise is done against some resistance it is called resistive exercise. Resistance is given by an assistant or through weight. Contraction and relaxation of the muscles are done in progression when static exercises, assistive exercises and non-assistive exercises are given.

Static exercises are done through contraction and relaxation of the muscles without joint movement, 5-20 repetitions per hour. This type of exercise is effective in cases of treatment of fractures or inflammation of joints and tissues, and also in chronic inflammation cases.

In resistive exercises, resistance can be provided manually (generally useful at the early stages), or mechanically (with barbells, dumbbells, springs, sand bags, iron bands, under-water exercises.)

There are two methods of providing resistance:

(i) Load resisting exercise (when load/weight is added in the natural way, to the minimum).

(ii) Load assisting exercise (weight arranged to counterbalance a desired amount of resistance).

USES OF THERAPEUTIC EXERCISE

It is necessary to balance the tensions in our daily lives, which cause our glands to pump adrenaline. Without compensating activity to use up the adrenaline, we are simply eating ourselves up inside. Exercise offers a tension-relaxation balance. It is therapeutic against daily stress.

The purpose of therapeutic exercise is to let you stretch the muscles, expand the lungs, and move in rhythmic relaxation from stem to stern. Exercise is considered the oldest single approach to good health. The thirty health advantages of regular and correct exercise are these:

1. It increases the capacity for respiration.
2. It circulates more oxygen to the tissues.
3. It establishes a better equilibrium between the oxygen required by the tissues and the oxygen made available.
4. It causes muscles to perform work in moving fluids through the body-which lightens the load on the heart.
5. It tends to reduce the height to which the arterial pressure rises during exertion.
6. It lessens the time during which blood pressure remains below normal after severe activity.
7. It holds off the incidence of cardiovascular disease.
8. It increases the functional activity of the red bone marrow in the production of red blood cells.
9. It aids lymphatic circulation, as well as the flow in the veins of the circulatory system.
10. It encourages collateral circulation, the formation of new branch vessels that distribute blood to the heart muscle by alternate routes.
11. It strengthens the heart and any other muscle being used in the body so that it works more efficiently.
12. It allows the resting heart to beat less often.

13. It lowers elevated cholesterol and triglyceride levels.

14. It stimulates the metabolism.

15. It promotes body growth and repair.

16. It tones up the glandular system to increase the output of the thyroid gland.

17. It provides an addition to the alkaline reserve of the body which may be of significance in an emergency requiring prolonged effort.

18. It more nearly attains absolute potential of the cells through chemical function.

19. It supplies a reserve of bodily strength and physical efficiency.

20. It affords a feeling of muscular vigor from increased muscle tone.

21. It expands the capacity for fuel storage, causing extra endurance.

22. It improves coordination through the transmission of nerve impulses and responsiveness of the muscle fibers.

23. It offers relief from neck and back pains, from headaches, and from other pains caused by lack of use of the various joints and muscles of the body.

24. It enhances digestion and elimination processes.

25. It allows for better and easier relaxation and sleep.

26. It results in a better mental performance, with keener learning processes.

27. It curtails the occurrences of fatigue and menstrual discomforts for women.

28. It minimizes the numbers of colds, allergies, digestive disturbances, and abdominal problems.

29. It tends to slow down aging.

30. It reduces the likelihood of obesity.

APPLICATION OF THE THERAPEUTIC EXERCISE

Therapeutic exercises are different from what most people think of exercise. Therapeutic exercises are specific exercises meant for correcting specific problems. The focus of Therapeutic exercises is on regaining flexibility, strength and endurance related to specific physical problems

What is Therapeutic Exercise?

Therapeutic exercise is the systematic and planned performance of body movements or exercises which aims to improve and restore physical function. Exercise is defined as "activity that is performed or practiced to develop or improve a specific function or skill to develop and maintain physical fitness

Aims of Therapeutic Exercise

- The ultimate goal of a therapeutic exercise program is the achievement of an optimal level of symptoms free movement during basic to complex physical activities.
- To improve and restore physical function.
- To prevent loss of function.
- To enhance a patient's functional capabilities.
- To prevent and decrease impairment and disability
- To improve overall health status, fitness and sense of well-being

Types of Therapeutic Exercises

Therapeutic exercises are classified according to the aim and purpose of the exercises into many types:

• Range of motion exercises which aim to maintain and increase range of motion as traditional ROM exercises (passive, active and active assisted ROM exercises) and techniques of joint mobilization and soft tissue stretching.

• Muscle performance exercises to increase muscle strength, power and endurance as resisted exercises and endurance exercises.

• Postural exercises to improve posture and correct faulty posture.

• Balance and coordination exercises to improve balance and coordination.

• Relaxation exercises to induce relaxation.

• Area specific exercises as breathing exercises and circulatory exercises.

FREE MOBILITY EXERCISE

The following are a selection of general mobility exercises. They are not in any specific order.

Shoulder Circles

Stand tall with good posture. Raise your right shoulder towards your right ear, take it backwards, down and then up again with a smooth rhythm. Perform this shoulder circling movement eight times and then repeat with the other shoulder. Breathe easily throughout.

Arm Circles

Stand tall with good posture. Lift one arm forward then take it backwards in a continuous circling motion, keeping your spine long throughout. Perform this arm circling movement eight times, before repeating with the other arm. Avoid the tendency to arch your spin whilst carrying out the circling movement. Breathe easily throughout.

Side Bends

Stand tall with good posture, feet slightly wider than shoulder-width apart, knees slightly bent and hands resting on hips. Lift your trunk up and away from your hips and bend smoothly first to one side, then the other, avoiding the tendency to lean either forwards or backwards. Repeat the whole sequence sixteen times with a slow rhythm, breathing out as you bend to the side, and in as you return to the centre.

Trunk Twists

Stand tall with good posture. Have your feet slightly wider than hip-width apart, knees slightly bent, hands resting on hips. Keeping your spine long and your hips facing forward, turn smoothly and slowly round to one side, then the other. Repeat the sequence sixteen times, breathing easily throughout the movement.

Half Squat

Stand tall with good posture holding your hands out in front of you for balance. Now bend at the knees until your thighs are parallel with the floor. Keep your back long throughout the movement, and look straight ahead. Make sure that your knees always point in the same direction as your toes. Once at your lowest point, fully straighten your legs to return to your starting position. Repeat the exercise sixteen times with a smooth, controlled rhythm. Breathe in as you descend, and out as you rise.

Standing Calf Stretch

Stand tall with one leg in front of the other, hands flat and at shoulder height against a wall or suitable immovable object. Ease your back leg further away from the wall, keeping it straight and press the heel firmly into the floor. Keep your hips facing the wall. You will feel the stretch in the calf of the rear leg. Repeat on the other side. Breathe easily throughout the exercise. Perform 3 to 6 stretches and hold each stretch for 5 to 10 seconds.

Lower Calf Stretch

Position yourself as for the standing calf stretch exercise. This time, however, flex the knee of the rear leg, whilst still keeping the heel pressed firmly on to the floor. The sensation of stretch should now be experienced lower down in the calf. Repeat on the other side, breathing easily throughout. Perform 3 to 6 stretches and hold each stretch for 5 to 10 seconds.

Seated Hamstring and Groin Stretch

Sit tall with both legs fully outstretched. Flex your right knee so that the right foot rests comfortably along your left inner thigh, with the right knee as close as

possible to the floor. Keeping your spine long and your shoulders down away from your ears, hinge forwards from the hips to reach towards your flexed left foot. Go as far forward as possible, then relax your spine to reach even further forward, holding this stretch position. You will feel the stretch along the back of the outstretched leg, and along the inside and rear of the flexed leg. Repeat with the other leg, breathing easily throughout. Perform 3 to 6 stretches and hold each stretch for 5 to 10 seconds..

Lying Hamstring Stretch

Lie flat on the floor with your knees flexed to approximately ninety degrees Raise your left leg, grasping it loosely behind the thigh with both hands. Now ease this leg as close to your chest as possible. You will feel the stretch along the back of the flexed thigh. Repeat with the other leg. Breathe easily throughout. Perform 3 to 6 stretches and hold each stretch for 5 to 10 seconds.

Lying Quadriceps Stretch

Lie face down on the floor, resting your forehead on your right hand. Press your hips firmly into the floor and bring your left foot up towards your buttocks, easing it closer to them with your right hand. You will feel the stretch along the front of the thigh. Repeat on the other side, breathing easily throughout the exercise. Perform 3 to 6 stretches and hold each stretch for 5 to 10 seconds.