Chapter I

INTRODUCTION

“Sports brings people closer to one another and help nation to a better mutual knowledge and understanding”


“When you are fit, you look better and are likely to have more physical energy; when you feel fit, two good things of life have more meanings two sky is bluer, the music is sweeter, the steak is tastier”.

Now a days more and more individuals particularly boys and girls are affected by sports activities and increasing the number that are representing in the sports area. As preventive and curative health measures, it has become more successful throughout the world and, millions of teenagers should have chance of enjoying sports.

During the last decade we have discovered that good health is no longer a matter of chance, but rather a matter of choice. If you choose to take responsibility for your health by
exercising regularly and by consistently adopting other positive life style habits, you can not only promote better health, but also you can decrease your risk of disease, disability and premature death. (Robert Hockey, 1993)

The lack of agreement regarding the concept of physical fitness basically centers on whether or not items involving skill and ability should by include in such a battery. Some authors list only the relatively basic elements, such as strength, muscular endurance and cardiovascular endurance. Other build from this base and include items of agility, flexibility, power, balance, speed and neuromuscular coordination.

1.1. PHYSICAL EDUCATION - OVERVIEW

Physical education is an integral part of education aims at all round development of man. It is education through physical activities for the development of the total personality of the child of its fitness and perfection in body, mind and spirit.

Physical education is generally associated with competitive sports or development of muscles or body building or military drill and calisthenics. Since physical education is an integral part of education, it is obvious that physical education and education should both work harmoniously in the total
process of education. Physical education should help to develop skills and attitudes, which will be conclusive to the wise use of leisure time and provide opportunities for educational control, living according to acceptable social standards and self-expression Walcharker (1995).

1.2. SPORTS

Today, modern world is a world of competition. In every phase of life people have to face one or other kind of competition. In this competitive world sports and games occupy a unique position. It is the area of friendly rivalry. Top class international sports meets are considered to be the international ambassadors for world supermodel in various sports and games.

Games and sports have been part of human life almost since the time immemorial. Be if a necessary for his survival i.e. hunting for food, shelter and safety from wild animals or other enemies or as a pursuit of pleasure. The games and sports have been indispensable to mankind and have become part of his culture. The games and sports are a great unifying force and have tremendous effect on the national and international integration people used sports.
Today, life mostly depends upon science and technology. In such circumstance people need more exercise to keep the body and mind fit to execute the activity efficiently.

Sports is the way which we use our physical capacities to play. Sports is important in other ways, when one’s body works better his mind works better, his brain and his body are interrelated. Sports allows you to blow off tension, to forget your problems for a while and to go out and have a good time no matter what other pressures one may be under in his life.

Sports have a very prominent role in modern society. It is important to an individual, a group, a nation—indeed the whole world. Sports have ever reflected developments in society. Sport, indeed has been a mirror of society. Sports is an institutionalized competitive activity that involves vigorous physical exertion or the use of relatively complex physical skills by individuals whose participation is motivated by a combination of the intrinsic satisfaction associated with the activity itself and external reward earned through participation.

Sports have great importance in human life. In this present day, no importance was attached to sports in the country. But, now it was realized that sports are very useful. So, every
educational institution of the country provides sports for all. As a matter of fact, sports are necessary part of education. Sports teach many qualities for the students. When they take part in sports, they have to obey some rules. So, sports teach discipline, which is very useful in practical life (Sidhu et al., 2002).

1.3. TRAINING

Training is a systematic process of repetitive progressive exercise of work involving learning and acclimatization. Training is the net summation of adaptations induced by regular exercise. Students on the exercises with reference to fitness state that it enables to tolerate more effectively, subsequently stresses of similar nature. The process of stressing the sportsman and his adaptation to this stress is called sports training and it is the means by which sports performance is improved.

Training has been explained as a programme of exercise designed to improve the skills and increase the energy capacities of an athletes for particular event (Fox, 1984).

The word ‘training’ means different things in different fields. In sports, the word training is generally understand to be a synonyms doing physical exercises. In a narrow sense, training is
doing physical exercise for the improvement of performance. This concept is reflected in words for terms which are given to a separate component of training or separate methods of procedures of doing physical exercises, sports, medicine and exercise physiologists also understand training to be doing physical exercise for improvement of performance or of separate performance factors (Hardhayal Singh, 1984).

Pierre Dumas explained ‘training’ as a methodological application of general and special exercise, performed either in groups or individually and designed to bring the athlete to his peak condition at the time of competition.

The major objective in training is to cause biological adaptations in order to improve performance in a specific task to enhance physiological improvement effectively and to bring about a change. Specific exercise and over load must be followed. By exercising at a level above normal a variety of training.

In general physical training imposes stress on the body tissues, in particular, the muscles. Chronic muscular activity which occur during training can be considered a (+) ve form of stress because it stimulates growth and improves muscular performance. The most of the changes that occur in the muscle
as a result of training are gradual and occur over several weeks or months. The magnitude of these muscular adaptations are somewhat proportional to the amount of exercise performed during training.

There is now a much broader base of knowledge regarding these special human beings and athletes and this is directly reflected in the methodology of training. New methods are surfacing which are often found to be useful in daily training (Wilmore and Costil, 1988).

The information collected from the training process includes physiological, biochemical, psychological, social and methodological information. Although this information is diverse it comes from the same source namely the athlete, and is produced by the same process, the training process. Training programme needs to also include periods of regeneration and recovery between training lessons, which is a necessary factor to ensure continuous improvement in the athlete's performance (Bompa, 1994).

Training denotes the process of preparation for some task. This process invariably extends to a number of days and even months and years. Means and measure from several sports
scheme disciplines significantly support the training of an advanced sports person.

Scientific training methods and application of basic principles of body mechanics in sports skill have been attributed to the higher level of performance in sports skills. Performance is the combined result of coordinated exertion and integration of a variety of functions. Genetic factor probably plays an important role in an individual's performance. It appears that up to seventy percent of an individual's maximal force, power or capacity is a matter of genetic factor. The environments as well as geographic location too play an important role in performance. Moreover performance to a certain extent depends upon the physical and motor fitness qualities in which definite improvement can be achieved through appropriate training (Bourchers and Malina, 1999).

1.4. SPORTS TRAINING

Sports training is the basic form of an athlete's training. It is the preparation systematically organised with the help of exercises which in fact is a pedagogically organised process of controlling the development of an athlete (Howard and Rosemary Payne, 1981).
Sports training is a basic preparation of the sportsmen for better performance through physical exercise. It is based on scientific principles of aiming at education and performance, enhancement. Sports activities consist of motor movement and action and their success depends to a great extend on how correctly they are performed. Techniques of training and improvement of tactical efficiencies plays a vital role in training process (Fox, 1984).

The term “Training” is widely used in sports. But there is some disagreement among coaches and sports scientists regarding the meaning of this word. Some experts understand that sports training is basically doing physical exercises, the factors essentials are sports equipment and implements verbal instructions, means of recovery, means of assessment of performance capacity, nutrition, psychological means etc. Further advanced training of sports persons significantly supported by several sports performance in addition to physical and physiological characteristics, the social and psychic capacities of the sports persons also have to improved.

Today sports trainings are mostly based upon the competitive motive each nation is trying to achieve top level performance and to win laurels in international competitions.
Today’s records are proved to be lower performance of tomorrow. This is because greater stress has been laid on the quality rather than quantity training (Watron, 1983).

It is always assessed, planned, organised and implemented by a coach or a sports trainer. Sport training is a dynamic process. It continuously goes on refining and perfecting its means and methods of the continuous improvement of sports performance. At the same time it is planned and carried out in such a way that optimum development of personality of sportsman takes place (Bourchers and Malina, 1993).

Sports training aims at improving the performance of spots persons. The sports performance depends on several factors like constitution, condition, technique, tactics, coordination and personality. Sports training is done for improving sports performance. The sports performance as any other type of human performance, is not the product of one single system (or) aspect of human personality. On the contrary it is the product of the total personality of the sports person. The personality of person has several dimensions. For example physical, physiological, social and psychic dimensions. In order to improve sports performance the social and psychic capacities of the sports person also have to be improved in addition to the physical and physiological ones. In
other words the total personality of sportsman has to be improved in order to improve his performance. Sports training, therefore, directly and indirectly aims at improving the personality of the sportsman.

High sports performance through sports training can be achieved by a scientific and systematic use of training means. Training means are various physical exercises and other objects, methods and procedure which are used for the improvement, maintenance and recovery of performance capacity and performance readiness (Hardhayal Singh, 1991).

Sports performances are achieved in training or in competition. High sports performance is not merely the product of physical, psychic and physiological prerequisites possessed by an individual sportsman. High performances are achieved after prolonged periods of training supported directly or indirectly by the society. Therefore high performance should also be considered as an expression of social will and efficiency. It is now an accepted fact in performance. Sports that a society which actively and consciously, supports the training and competition system is able to win more medals in international competition.

The aim of sports training to find the hidden reserves and make two sports person couture it. It also aims at gather
development of the reserves. The sports persons are able to control their day today routine in such a manner that they are able to do training once or twice a day of high effect, sports training is basically an endow process so, it strives to develop all two aspects of personality. It is a continuous process of perfection improvement and creation of means of methods of improving sports performance and factors of performance. Physical fitness plays an important role in all sports and games. All the living individuals must possess the physical fitness. Physical fitness can be divided into two distinct categories the health related physical fitness and skill related physical fitness.

According to Fox (1984), sports training is a programme of exercise designed to improve the skills and increase the energy capacities of an athlete for a particular event. These basic training procedures will serve better when utilized with modifications suited to individuals or a group dealt with. The training programme should look into improving the performance of the athletes and at the same time should prevent possible injury.

The major components which influence the physical performance of an athlete are strength, speed, agility, endurance, power and coordinative abilities. Action potential depends on
natural abilities and at the same time fundamentals act as the foundation for excellence.

When you decide on a training system, you should come up with a movement pattern and speed that closely mimic the actual sports performance (sprinters pulling a sled with a weight on it). One cannot do any specific training system using isometric actions because no limb movement takes place.

Our bodies are miracles of adaptability, capable of altering themselves in response to loads placed upon them in such a way that future, and similar loads will be less stressful. Likewise, they can and will adapt to have no demands placed upon them, becoming increasingly weaker and less capable.

In an earlier age when so much time was spent and engaged in physically demanding activities, muscular systems of people were stimulated vigorously. So, going out of the way to engage in strength training was generally unnecessary.

1.5. YOGA

Yoga is universally benefiting all people of all ages. The study of Yoga is fascinating to those with a philosophical mind and is defined as the silencing of the mind's activities which lead
to complete realization of the intrinsic nature of the Supreme Being. It is a practical holistic philosophy designed to bring about profound state as well is an integral subject, which takes into consideration man as a whole. The aim of Yoga is to devise ways and means of helping the better emotional and intellectual concentration.

1.6. MEANING OF YOGA

Yoga is a science of right living and it works when integrated in our daily life. It works on all aspects of the person: the physical, mental, emotional, psychic and spiritual. The word yoga means ‘unity’ or ‘oneness’ and is derived from the Sanskrit word ‘yuj’ which means ‘to join’.

This type of effort is possible only through the control over sense organs and through continued practice and detachment.

“The withdrawal of sense organs from the worldly objects and their control is Yoga”.

B.K.S. Iyanger (1983) states, “Yoga is a time less practice since over thousands of year dealing with physical, mental, and spiritual well being or human society as whole”.
‘Stilling the minds movements in Yoga’.

**Maharishi Rethathiri (1985)** states "Yoga is a systematic physical practice to improve awareness to develop will power and to realise self to join traditional consciousness (jeevathma) to super consciousness (parmathma).

Yoga is the inhabitation of the modification of the mind. This means that it prevents to contents of the mind from taking different forms.

**Sreekumar (1960)** states, “Yoga is a training in the techniques of harmony and also a preparation for the total integration of human personality”.

**Heare (1984)** says that Yoga was first summarised and systematized around the second century A.D. by Patanjali and his Yoga sutra is still regarded as the classic work on the subject. Hence, Patanjali is known as the father of Yoga. He has joined a number of Yoga sutras regarding Yoga.

Yoga has been practised in India for thousands of years, and is traditionally used by spiritual seekers as a system of self-development for purification of the body and mind
(G. Feurestein, 2001). Yoga is proposed to be a preventive as well as curative system of the body and spirit.

1.7. NEED OF YOGA

Yoga plays an important role by bringing the therapeutic effect in asthma, diabetes, hypertension, and respiratory troubles. Some Yoga has both preventive as well as curative values. Positive charges in the life style of the people can brought through Yoga. During the period of education, Yoga can make them aware of their bodies and further make them realize the need of emotional and physical well being.

Yoga control's one's sense resulting in an integrated personality. Behaviour can also be moulded properly leading balanced personalities.

Raja (1985) stated that Yoga is universal without distination of religion, nation, caste, language, colour, age or sex. It is common to all. Yoga is science.

Kuvalyananda (1977) stated that Yoga has complete message for humanity. It has a message for the human body. It has a message for the human mind, and it has also a message for the human soul.
1.8. TYPES OF YOGA AND ITS IMPORTANCE

There are many different types of Yoga. Briefly, here are few of the more popular types of Yoga available today.

1.8.1. ASTANGA YOGA

It is a type of Yoga where one moves relatively quickly through a full range of asanas. This is Yoga where you can really work up a sweat as well as get and keep your heart rate up. It is good type of yoga for a person who is relatively young and already in good health.

1.8.2. BIKRAM YOGA

It was popularized by Bikram Choudhary (India). This Yoga is done in very warm rooms with 85-90 degrees. Bikram states that since yoga is developed in hot climate, students will get more out of it by doing it in similar environment. He further states that the heat of the room warms the muscles up (so there is no need for warm-up exercises) and reduces the number of injuries (this has not been proved by any exercises yet). It’s a good form of yoga for the people who are already in good health.
1.8.3. CLASSICAL YOGA

It was the first type of yoga brought to the U.S.A. and Europe, popularized by Indira Devi (Eugiene Peterson) classical yoga concentrates on the main asanas used in India and uses very few ‘Pre-Yoga’ or ‘warm-up’ exercises. This makes it a rather difficult form of yoga for the average American because of our physical life style, bad backs, and general lack of flexibility. It is good for people who already have some degree of flexibility and are in relatively good physical shape. There are lots and lots of book and teachers of Classical Yoga.

1.8.4. IYENGAR YOGA

It concentrates on the alignment of the body and posture in the asanas (to help reduce injuries) while building flexibility and strength. Iyengar was one of the first teachers to present an organized outline of how Indian Medicine used each of the yoga asanas for particular physical alignments. While most Iyengar style classes would be too strenuous for someone with I C.

1.8.5. STRUCTURAL YOGA

It is an off-shoot of Iyengar other forms of yoga and was developed by an American Physical Therapist and yoga instructor
Tom Styles, PT. He and other teachers like him have done a lot of work to help adapt the structural and alignment qualities of Iyengar yoga with many pre-yoga and physical therapy movements. Their work has made it easier for the average Westerner to work gradually and safely into the other types of yoga. This is an excellent style for someone who is injured or is sick and is highly adaptable for people with I C.

1.8.6. ACU – YOGA

It is a form of yoga which helps stimulate the Acupuncture meridians and points from Chinese medicine without using Acupuncture needles. This is an excellent style of yoga for people who are dealing with special issues.

1.8.7. RESTORATIVE YOGA

It is almost completely passive style of yoga. Students are placed on various bolsters, pads, folded blankets etc., and are completely supported in pose. This gives them the benefits of the pose without the effort of performing it. This type of yoga is used very successfully with very ill people.
1.8.8. VINYASA YOGA

It is similar in some ways to Astanga yoga, in that students move from one posture to another very quickly. However the Vinyasa style is usually gentler and less strenuous than the Astanga yoga.

1.9. IMPORTANCE OF YOGA

Yogasanas are the physical practices which tone up the internal organs of the body. The body that is visible from outside is only a skeleton covered by muscles cells which give it a shape. Until and unless our internal organs are healthy, we cannot be healthy. We see that the heart works for all the 24 hours and does not take rest even for a single moment. The heart can get rest only when the nerves carrying the blood to and from the heart are clean. Even a small obstruction in them can cause a major disorder. Our lungs should also function properly and take maximum air full of oxygen for purifying the blood. Similarly of juices for the proper digestion of food. The formation of juices, blood, muscles, fats, bones, semen should take place according to the need of the body. Our nervous system should get strength so that all body movements can be performed in a proper way. The
impurities should not get accumulated in the body and we should be able to enhance our muscle power.

Some people, however, question why we should prefer yogasanas to other exercises such as gymnastics, wrestling and popular games.

1. Other exercises affect only the muscles outwardly; therefore, the body appears quite strong and healthy. However, these exercises do not have as much impact on the internal organs of the body as the yogasanas. Yogasanas are very effective in throwing out all our body wastes and in activating our glands, on the proper functioning of which depends our health and happiness. They give wonderful powers and increase longevity. Moreover, in doing asanas the number of cells that break in small, while the number of new cells that are formed is proportionately very large.

2. Other exercises have very little impact on the mind and sense organs. While the asanas improve mental power and help in controlling the sense organs.

3. Yogasanas improve our resistance power against disease and do not allow any external matter to accumulate in the body. In this way, they keep the body free from the diseases.
4. For sports and other exercises, we need considerable space and several persons. Asanas on the other hand can be performed in relatively little space and all by oneself. All that needed is a carpet or bed-sheet. However, we must teach them first from a person who knows the technique well.

5. Yogasanas increase the elasticity of our body and make the body more active and supple. The blood circulation takes place more smoothly and properly and the body becomes capable of more work. We look young in spite of our age. Other exercises, on the other hand, make the muscles stiff and hard. The body becomes stiff and the old age comes sooner.

6. As a drain is cleaned by sweeping and by putting water into it the different asanas clean the blood-circulation drains of our body in the same way. Clean blood circulates freely in all part of our body, and helps keep our body free from impurities. This is possible only by yogasanas and not by other exercises which increase our heartbeat abnormally. They do not have the capacity to clean the blood unlike the asanas.

7. Our youth depends upon our spine that controls the entire nervous system and blood circulatory organs. The greater the elasticity in the vertebral column the greater the vigour and longer the life.
8. Other exercises have little impact on the character of the person. However, yogasanas not only improve body health, they also have a sobering effect. On the mind, they build up mental and ethical powers. The mind becomes balanced and peaceful. This in turn brings about equanimity and satvic ideas.

9. In fact, yogasanas, Pranayama and six yogic practices of publication are a panacea of all ills. They have a unique power to throw waste products out of the body. They can therefore be depended upon for physical and mental well being.

10. Besides having physical, mental and moral effects, yoga system leads a man to spiritualism. No other system has such wide ranging impact on human body, mind, brain and intellect.

1.9.1. PRANAYAMA

Pranayama' is the fourth stage in Pathanjali's eight stage Yoga discipline. Two Sanskrit words are combined in the word 'Pranayama' - Prana and Ayama. 'Prana' means life or life force. 'Ayama' means development or control. Therefore Pranayama is the development and control of life force. It is a form of breathing exercise, very important in yoga. It goes along with the asanas or exercise.

Breath is the life force that sustains life. Nobody can survive more than a few minutes without air. When the breath stops, life
ends. The Forefathers of Yoga developed a special system- ‘Pranayama’ to increase, develop and control this life force. Normal breathing use only a fraction of our potential respiratory capacity. Pranayama helps to control this life force in a superior and extraordinary way to reap maximum benefits.

There are various types of Pranayama. Some of the popular forms are Ujjayee, Shitali, Viloma, Kapalabhati, Anuloma, Suryabhedana, Bhasrika etc. There are variations in performing different Pranayamas. Some of them can be done in a sitting position while others in a standing line or sitting position. Some of the Pranayama are difficult and complicated to perform while others are easy.

Pranayama can be mastered only gradually. It may take months or even years before the practitioner mind becomes receptive to the regulated flow of breath and he experiences the full benefits of pranayama. Proper practice of pranayama can control almost any disease but improper practice may give rise to all sorts of respiratory ailments. So one should take care to acquire control over his breath gradually

1.9.1.1. NADI SHODHANA

Sitting in the padmasana position or crossed-legged, place the index of the right hand in the centre of the forehead between the eyebrows. One should begin by exhaling completely; than
close the right nostril with the thumb and inhale through the left nostril counting four heartbeats, hold to a count of sixteen, then open the right nostril while closing the left with middle finger. Exhale through the right nostril to a count of eight beats. Keeping the fingers in the same position, inhale through the right nostril counting four beats, then hold the breath to a count of sixteen exhaling through the left nostril counting up to eight. This form the complete cycle.

1.9.1.2. SITALI

The position to be adopted is Padmasana, Siddhasana, or simply crossed-legged. The tongue protrudes roughly one inch over the lip. It takes the form of a freshly rolled leaf about to open, i.e., folded lengthwise both inside and outside the mouth. We inhale by drawing in the air through the channel formed by the tongue making an ‘SSSSS’ sound until the lungs are completely filled. Once inhalation has been accomplished, the tongue is drawn in, the lips closed and the breath held for several seconds. The air is then let out slowly through the nose. This completes the cycle. The exercise should be repeated two or three times, followed by complete relaxation. The number of cycles should gradually be increased.
1.9.1.3. SITHKARI

Sit in meditation posture with an erect spine. Exhale from both nostrils. Fold the tongue back wards and press the tip of the tongue by hard palate, leaving narrow openings on either side of the tongue. Inhale through these side openings making a hissing sound. Allow the breath to be stopped with ease, exhale slowly and continuously through both nostrils. Then allow the breath to stop with ease and release.

1.9.1.4. NADI SUDHI PRANAYAMA

Sit erect in padmasana, keep the spine erect. Stretch the arms and place then on the knees. Perform cin mudra by left hand. Fold the right hand from the elbow and place the right thumb on the right side and ring, little fingers on the left side of the nose, where as middle and index fingers folded. Close the right nostril by thumb and inhale slowly and deeply through the left nostril. After full inhalation close the left nostril and exhale slowly and steadily through right nostril employing the lungs completely after complete exhalation. Now start inhaling through right nostril slowly and deeply, while keeping the left nostril closed. After complete inhalation close the right nostril and start exhaling through the left nostril.
1.10. MOTOR ABILITY

“The immediate capacity of an individual to perform in many varied stunts or athletic events”.

The present acquired and innate ability to perform motor skills of a general or fundamental nature, exclusive of highly specialized sports or gymnastic techniques.

1.10.1. FLEXIBILITY

Flexibility is the ability of an individual to move the body and its parts through as wide range of motion as possible without undue strain to the articulations and muscle attachments.

Flexibility is that pertains to the functional capacity of joints to move through normal range of motion.

Flexibility as one of the components of physical fitness plays a major role in the efficient functioning of the day to day activities of the individuals.

The flexibility is the basic pre-requisite for a good quantitative and qualitative execution of sports movement.

According to Yuhasz (1977), “Flexibility is the range of joint motion, that is, the degree at movement that can be achieved at the various body joints”.

According to Singh (1984), “An improvement in flexibility can result an improvement in athletic performance. An increase
in flexibility permits the athlete to exert force over greater distance and thereby to generate greater force”.

Flexibility is very important performing the movement with high degree of skills, the technical skills to a lesser or greater extent is affected by the flexibility of the concerned joints. Insufficient flexibility leads to errors in movement flow. Movements rhythm; movement coupling extra, learning of movements (motor learning) becomes difficult for the sportsmen who are lacking flexibility.

Extent flexibility is the ability to flex or stretch the trunk and back muscles for a possible in either a forward lateral or backward direction.

Flexibility like any other motor ability can be of different types. The three important types of flexibility are described below.

1.10.1.1. Active Flexibility

It is the ability to do the movement with a larger amplitude when the body is in motion.

1.10.1.2. Passive Flexibility

It is the ability to do the movement with larger amplitude with external help.
1.10.1.3. Dynamic Flexibility

The ability to do the movement with larger amplitude when the body is in motion.

1.10.2. CARDIO RESPIRATORY ENDURANCE

It is the sustained a series of an activity without undue taxing the physiological systems that furnish the fuel and oxygen to the muscle.

1.10.2.1. Role of the Cardio-Respiratory Endurance in Sports Performance

Once capacity of doing work for a prolonged period is different from another, one can work for a long period but other does not. Endurance is a term that denotes prolonged sustained or respective activity.

Cardio respiratory endurance is characterized by moderate contraction of large muscle groups. For relatively long periods of time during which maximal adjustment of the cardio respiratory system are necessary as in sustained running, swimming, climbing and the like, when many muscles are worked hard the circulatory and respiratory systems directly support the muscle work.
1.11. PHYSIOLOGICAL VARIABLES

Among the many physiological variables, the researcher has selected variables such as resting pulse rate, breath-holding time, and mean arterial pressure as it is associated with yoga and exercises.

1.11.1. RESTING PULSE RATE

It is the numbers of beats felt exactly for a minute. The average rate of the pulse in a healthy adult is 72 beat in each minute. There may be variation of up to five beats per minute within normal range.

1.11.1.1. Role of Resting Pulse Rate in Sports Performance

The pulse rate and heart rate vary greatly among different people and in the same person under different situation. The American heart rate association accepts as normal a range from 50 to 100 beats per minute. Some endurance athletes with very strong and efficient heart share rate as low as 45 beats per minutes.

Regular participation in endurance activity such as jogging, cycling and distance swimming can be done to reduce the pulse rate. Good cardio respiratory condition would be indicated by a pulse rate of 60 for women and 50 for men. The lesser pulse rate gives good performance for all sports and games.
1.12. BREATH HOLDING TIME

It is the duration of time through which one can hold his/her breath without inhaling and exhaling after a deep inhalation. **Strukic (1984)**

1.12.1. Role of Breath Holding Time in Sports Performance

The breath training is achieved simply by carrying out the activity for which one is training. Physical training may influence a number of factors which constitute sports performance capacity that is, it may cause changes not merely in muscle strength and maximum oxygen uptake, but also structural and functional changes in a number of oxygen systems as well as psychological changes. The endurance type of training will improve the breath holding time.

Hematological variables have been defined as those factors related to blood and its composition.

Blood is a vital connective tissue (Fluid) consisting of fluid portion i.e., plasma in which the formed elements such as Red Blood Corpuscles’, white blood corpuscles, and platelets are suspended. Plasma contains 8% of solids, which include proteins (Albumin). Non protein nitrogenous substances (cholesterol and glucose) pigments, salts, enzymes. Hormones, antibodies and immune bodies.
Being the most vital fluid of the body, blood functions are enumerated as follows:

- Acts as an oxygen carrier from lungs to the body tissues.
- Carries back carbon-di-oxide and waste products to be removed through excretory organs. Example: lungs, kidneys and skin.
- Supplies nutrients to all parts of the body tissues.
- Transports hormones, enzymes, vitamins to body tissues.
- Form antibodies to resist infection.
- Maintains body temperature, body fluid volume and electrolyte balance. *Vitya rattan (1989).*

### 1.13. HEMOGLOBIN

Hemoglobin is the red pigment of blood present inside the erythrocytes. The most characteristic property of hemoglobin is the case with which it combines with O\(_2\) and dissociates from it. Hemoglobin is chief participant in respiratory phenomenon as well as acid base homeostasis. The physiological importance of hemoglobin is due to its capacity to combine reversibility with O\(_2\), oxygen combines with hemoglobin to form oxyhemoglobin readily at high partial pressure as existing in lungs. Oxygen is also readily released from oxyhemoglobin at low O\(_2\) pressure, as prevailing in the tissues. This property of hemoglobin provides an
effective and excellent system for the transport of O₂ from the atmosphere (lungs) to the cells of the body.

Although research in this area has not always produced consistent data, physical training is generally found to result in increased blood volume and total hemoglobin content. Most of the increase in blood volume reflects an increase in the amount of plasma rather than an actual rise in the red blood cells volume. The blood’s hemoglobin concentration is therefore usually unchanged or slightly decreased after training. Both total blood volume and hemoglobin are important with respect to the oxygen transport system, particularly, during exercise at altitudes above sea level. Blood volume is also an important factor during exercise, since deep body heat is the dissipated into the environment. Aerobic exercise can also lower cholesterol risk, even in cases where the cholesterol level stays the same. And we can change that form, by changing the blood proteins that act as carriers for much of the cholesterol in the blood.

Hemoglobin is the red blood pigment, which binds with oxygen. Hemoglobin (Hb), a complex compound found in red blood cells that contains Iron (hemo) and Protein (globin) and is capable of combining with oxygen. Hemoglobin concentration in women is normally greater than 12.09/dl. Hemoglobin is nearly 100 per cent saturated with oxygen at a PO₂ of around 100 mm
Hg, the normal PO$_2$ found in the alveoli at sea level. This means that very O$_2$ can be further combined with Hb at a higher partial pressures of oxygen. One practical aspect of this fact relates to the breathing of pure O$_2$ at sea level. It is obvious that only an insignificant amount of O$_2$ will be further added to the blood under these conditions.

The red blood corpuscles or erythrocytes are non nucleated biconcave disc in the blood. They carry oxygen to all the parts of the body. The red blood corpuscles are calculated in terms of cells per cubic millimeter.

RBCs due to their hemoglobin content act as carrier to all the body tissues. Thus they provide gaseous exchange between tissues and environment.

They also carry CO$_2$ from body tissues to the lungs for excretion. Carbonicanhydrase in RBC enhances the rate of action between CO$_2$ and water 250 times and thus facilitates CO$_2$ carriage. RBCs maintain blood viscosity.

They maintain osmotic relationship with plasma. Bilirubin is formed from RBCs disintegration, and this is chief pigment of bile.

RBCs are produced in bone marrows and the life span ranges between 90-140 days. **Vidya rattan (1989).**
Bio-chemical variables chosen for the investigation of this study have been defined as those related to the blood and its biochemical composition.

Of the several bio-chemical composites such as blood sugar, cholesterol, lactic acid and pyruvic acid two of the most important variables i.e. blood sugar and cholesterol were selected for this study. Brain tissues entirely depend on blood sugar for their energy needs. Diminution of blood sugar even for few minutes will lead to death of brain cells. Likewise excess cholesterol (LDL) may block arteries which may lead to heart attack and atherosclerosis (Blocking of Arteries), normal amount of cholesterol is essential for RBC and WBC production, biosynthesis of adrenal cortex hormones, transport of fatty acids and to enhance the antigen sensitivity. Considering the above vital roles played by them. The cholesterol and blood sugar were selected as bio chemical variables for the investigation.

1.14. BLOOD SUGAR

Glucose also called dextrose or blood sugar is formed as a natural sugar in food or is reduced in the body as a result of digestion of more complex carbohydrate. Glucose can be used directly by the cells for energy or stored as glycogen in the
muscles and liver or converted to fats for energy storage. **Katch and Katch (2000).**

Blood glucose is solely derived from liver glycogen via glucose – 6 - phosphate to maintain blood glucose level within normal limits of 70 to 100 mgm%. *(Vidya Rattan 1989).*

**1.14.1. Importance of Blood Sugar**

There is prime necessity to maintain blood sugar level constant. The nervous tissue depends for its energy needs exclusively on blood glucose. If blood glucose content suffers a diminution below 50mg% adverse symptoms follow, leading on to even death. It is in this respect that the maintenance of blood sugar assumes paramount importance in the homeostalic of mechanisms of the body. When blood sugar content exceeds 180mg% the glucose is excreted in the urine. *(Subramaniam, 1974)*

**1.15. OBJECTIVE OF THE STUDY**

Yogic practices play an important role in the development of the balance created in the nervous and endocrine systems which directly influences all the other systems and organs of the body. Yoga acts both as a curative and preventive therapy. The very essence of yoga lies in attaining mental peace improved concentration powers, a relaxed state of living and harmony in relationships.
Through the practices of yoga, we become aware of the interconnectedness between our emotional, mental and physical levels. Gradually this awareness leads to an understanding of the more subtle area of existence. The ultimate goal of yoga is to make it possible for you to be able to fuse together the gross material (annamaya), physical (Pranayama), mental (manomaya), intellectual (vijnanamaya), and spiritual (anandamaya) levels within your being. There are number of studies already undertaken in yoga. However, no study has been conducted on effect of varied packages of yogic practices on selected motor ability components, physiological, hematological and bio chemical variables among college men students.

Hence, the investigator had taken up the research to find out the effects of varied packages of yogic practices on selected motor ability components, physiological, hematological and bio chemical variables among college men students in Tamil Nadu.

1.16. REASON FOR THE SELECTION OF THE TOPIC AND VARIABLES

High level of sports performance depends upon various factors such as genetical factors, training status, physical structures, nutritional factors, psychological factors, physiological factors, socio-economical factors and techniques. However, the
requirement of the above facts in mind, the researcher has selected this topic. Further, the selected dependent variables have close association with yoga and physical exercise.

1.17. STATEMENT OF THE PROBLEM

The main purpose of the study was to find out the effects of varied packages of yogic practices on selected motor ability components, physiological, hematological and bio chemical variables among college men students.

1.18. HYPOTHESES

The following hypothesis were drawn for this study,

1. There would be significant difference among the experimental groups on motor ability components (flexibility, cardio-respiratory endurance), physiological (resting pulse rate, breath holding time), hematological (hemoglobin, red blood corpuscles), bio chemical (total cholesterol, blood sugar) variables among college men students.

2. There would be significant improvement on selected criterion variables such as flexibility, cardio respiratory endurance, breath holding time, hemoglobin and red blood
corpuscles among college men students due to varied packages of yogic practices.

3. There would be significant reduction on selected criterion variables such as resting pulse rate, cholesterol and blood sugar among college men students due to varied packages of yogic practices.

1.19. DELIMITATIONS

The following were the delimitations of the study

1. For the purpose of the study, sixty college men students studying in Sir Theagaraya College, Chennai, SRM College of Arts and Science, Chennai and Patrician College, Chennai, Tamil Nadu, India were randomly selected as subjects.

2. The subjects were randomly assigned into three groups of twenty each (n=20). Group I underwent first package of yogic practices, Group II underwent second package of yogic practices and Group III acted as control who did not undergo any special training programme.

3. The duration of the experimental period was restricted to twelve weeks. The number of the sessions per week for both experimental groups was confined to five.
4. The following motor ability components, physiological, hematological and biochemical variables namely flexibility, cardio respiratory endurance, resting pulse rate, breath holding time, hemoglobin, red blood corpuscles, cholesterol and blood sugar were only selected for the study.

5. The selected criterion variables for the study were assessed by using the following standardized test items. Flexibility and cardio respiratory endurance were measured by using sit and reach test and cooper’s 12 min run/walk test respectively. Resting pulse rate and breath holding time were assessed through radial pulse and holding the breath for time separately. Hemoglobin and red blood corpuscles were measured through K.M. Samuel method of blood testing. And Cholesterol was measured by using Zak’s method of blood testing and blood sugar was assessed through Asatoor and king method of blood testing.

6. The data were collected at two days before and two days after the last training session in the experimental period.

1.20. LIMITATIONS

In this study, the following limitations were drawn.
1. No change was made in the daily routine of the subjects who might influence results during the collection of data and this was considered as limitation.

2. The climatic conditions at the time of conducting the test might influence the performance of the students.

3. No effects were made to either control or assess quality of food ingested. The quantum of physical exertion, lifestyle, psychological stresses and these were recognized as a limitation.

4. The general mode, environmental factor and performance in the test by the subject were also recognized a limitation of the study due to varied social, cultural and environmental factors were not taken in consideration.

5. The previous experience of the subjects in the training was not considered.

**1.21. SIGNIFICANCE OF THE STUDY**

1. The study will help to know the level of improvement of selected motor ability components, Physiological, Hematological and bio chemical variables through varied packages of yogic practices.
2. The study will help to know the various factors related to the improvement of physical fitness through varied packages of yogic practices.

3. The results of the study would provide an additional knowledge in the area of research.

1.22. DEFINITIONS OF THE TERMS

1.22.1. Yogic Practice

Gore (1985) explains, “Yogic practices are generally looked up as exercise and many time interpreted in the light of exercise physiology. The physiology of yogic practices differs greatly from that of exercise physiology. The nature of every yogic practice is Psycho Physiological”.

1.22.2. Flexibility

It is the ability of an individual to move the body and its parts through as wide range of motion as possible without undue strain to the articulations and muscle attachments.

1.22.3. Cardio-Respiratory Endurance

It may be defined as a series or reputations of an activity with out unduly taxing the physiological system that furnishes the fuel and oxygen to the muscle. Shaver (1981)
1.22.4. Resting Pulse Rate

The distention of the arterial walls at the beginning of symbolic ejection of blood which is not confined to aorta but travels down the arteries as a wave followed by a wave of recoils known, as the resting pulse. The arteries that lie close to the body such as radial artery of the wrist, the arrival of the wave of distention and subsequent recoil may be felt as a pulse which offers a convenient method of counting the pulse rate. Shaver (1981)

1.22.5. Breath holding time

The duration of the time through which one can hold his/her breathe without inhaling or exhaling. Shaver (1981)

1.22.6. Hemoglobin

Hemoglobin means a complex compound found in red blood cells that contain 6% iron (heme) and 94 % protein (globin) and it combines with oxygen to transport oxygen throughout the body. (Ardy Fried berg, 1988)

1.22.7. Red Blood Corpuscles

Red blood corpuscles (also referred to as erythrocytes) are the most common type of blood cell and the vertebrate organism's principal means of delivering oxygen (O2) to the body tissues via the blood flow through the circulatory system. They
take up oxygen in the lungs or gills and release it while squeezing through the body’s capillaries.

These cells' cytoplasm is rich in hemoglobin, an iron-containing bio molecule that can bind oxygen and is responsible for the blood's red color. (www.wikipedia.org)

1.22.8. Total Cholesterol

Total Cholesterol is the total amount of cholesterol in the blood (www.webmd.com)

1.22.9. Blood Sugar

The main sugar that the body makes from the food in the diet. Glucose is carried through the bloodstream to provide energy to all cells in the body. Cells cannot use glucose without the help of insulin. (www.medterms.com)