CHAPTER I

INTRODUCTION

Sport plays a very prominent role in the modern society. It is important to individuals, a group, a nation and indeed the world. Throughout the world, sport has a popular appeal among people of all ages and both sexes.

Much of the attraction of sport comes from the wide variety of experience and feeling that result from participation such as success, failure, exhaustion pain, relief and feeling of belonging. Sport can bring money, glory, status and goodwill. However, sport can also bring tragedy, grief and even death. (Uppal, 1992)

As the amount of leisure time has increased in modern society time spent on sports has grown, while very few participate at the elite or Olympic level, there are many more who participate at the local or community level, for others involvement in sport is a passive one as spectators, coaches, umpires, teachers or sports writers.

Sports have an undeniable role in the society. As society changes so does sport. Games in the early years were local and informal. The rules were simple and changing according to the number of participating and the local. As cities grew, clubs were formed and interclub competitions began. Eventually cities played against other cities as transportation developed and as coaches, steamboats and railways reduced the time to travel long distance. Finally, there were regional,
national and international competitions and corresponding governing bodies. All these developments took time and occurred as cities reached a certain stage of development and inventions occurred to make these improvements possible. (Uppal, 1992)

Sport 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 the external rewards earned through participation.

Man by nature, is highly competitive and in pursuit of performance he has always been striving to jump higher and farther, to run faster and to demonstrate greater strength and skill. Physical fitness plays emphasis on more and more activity.

The preparation of an athlete today for achievement is a complex dynamic matter, characterized by a high level of physical and physiological efficiency and the degree of perfection of necessary skills, knowledge and proper teaching and tactics. An athlete arrives at this state only as a result of corresponding training sports activity directed at steadily enhancing the preparation of an athlete and grooming him for a higher level achievement.

Sport is an important ingredient of physical education and is a worldwide phenomenon today. The unprecedented popularity and better organization of sports
activities and competitions would have been impossible without the recognition of
the important of sports competitions in the world. The world has realized the
importance of sports for the modern civilizations. (Uppal, 1992)

In recent times, the field of sports has become popular, since youth in quite
large members from developed, developing and under developed countries are
participating in large numbers with a recreational and professional approach. The
outcome of their quantitative participations is the resultant performance and vast
improvement in the sports and games standard. The impact of knowledge of science
on sports has raised the standard of sports manifold during the passed century. The
improvement in performance as taken place due to the application of the science at
various levels, such as improvement in facilities, training methods, conditioning,
nutrition, psychological intervention strategies and professionalization of sports
itself.

Fitness is a state which often characterizes the degree to which a person is
able to function. Ability to function depends upon the physical, mental, emotional,
social and spiritual components of fitness, all of which are related to total fitness.
While fitness is the maximal, economical and efficient functioning of the body,
health is referred to as optimal homeostatic functioning of the body. (Hardyal
Singh, 1996)
1.1 GAME OF HANDBALL

Handball, a popular game throughout the world, was introduced in Germany by a gymnastics teacher, Max Heiser, in 1917. The game was primarily devised for girls and played 11-a-side on a football field. There are, however, authentic reports of a similar game, “Handbold” being played in Denmark as early as 1904. (Lohar, 1998)

In 1919, another Berlin sports teacher, Carl Schelenz, modified the existing rules. He advocated the use of a smaller ball, the players were allowed to fight for the ball, the three-step rule was introduced and the 16-metre penalty area of the football field provided an ideal throwing zone. Soon other countries accepted these rules and handball was on its way to becoming an international sport.

In 1923, the first inter-city match between Berlin and Dresden took place, while the first international handball match was played between Germany and Austria on 13 September 1925.

During the Olympic Games of 1928 in Amsterdam, 11 countries got together to found the International Handball Federation (IHF). Along with the increase in members, another innovation took place in the Scandinavian countries, where due to the climatic conditions, handball was taken indoors. The rules were modified and adapted to indoor conditions and finally evolved to the format prevailing today.
A great boost to the sport was provided in 1972, when handball was introduced as an Olympic discipline at Munich. (Lohar, 1998)

1.2 HANDBALL BASIC TECHNIQUE

The growing popularity of handball is not only due to the fact that it is a healthy competitive sport, but also due to the simple rules and even simpler equipment needed: a ball, two goals and a small playing field (not forgetting, of course, the seven players needed in a team).

The introduction of referees, unlimited substitutions, tactical moves, the quick switch from defence to attack have all contributed to the game enjoying universal popularity and it is now played in as many as 95 countries. (www:IHF.com)

In India, the game was first played at Rohtak (Haryana) in 1972 and since then it has spread all over the country. Its inclusion in the 1982 Asian Games at New Delhi was a major factor in helping to popularise the game in India.

Handball is played by two teams, composed of six players and a goalkeeper each, who try and throw the ball into their opponents’ goal. Since the basis of the game is catching, throwing, jumping and shooting at goal, handball is a sport that develops the bodies of young players as well as keeping older players physically fit.
A handball player must first and foremost be a good runner with an ability to make quick spurts. He must also have a knack of catching and throwing with precision to teammates. Good dribbling skills are a basic requirement and finally, a player must have the ability, to shoot at goal. These requirements mean that a player must train his body, arms and legs function as one harmonious unit.

(www:IHF.com)

The basic elements of training a handball player must include gymnastic exercises, running, jumping, catching, ball handling skills, tactical awareness and probably the most important, a sense of fair play.

1.3 ANTHROPOMETRIC MEASUREMENTS

Anthropometric Measurement is defined as set of noninvasive, quantitative techniques for determining an individual's body fat composition by measuring, recording, and analyzing specific dimensions of the body, such as height and weight; skin-fold thickness; and bodily circumference at the waist, hip, and chest.

(www.medicaldictionary.thefreeonlinedictionary.com)

Physical educators have long realized that the performance of men and women is greatly influenced by such factors of age, height, arm length, leg length and body structure.

The sculpture of Greece and Rome preserve the ideas of those civilizations concerning the idea proportions of the human figure. It is interesting to see in their
sculpture the swing of the pendulum of approval from athlete who were broad shouldered, thick set square cheated and very muscular, to athletes who are leaner, more supple, and whose figure are more representative of the skills of the finer coordination. Since the early times there has been continued use of anthropometric measurement to determine its relationship with performance in different games and sports.

Anthropometric variables such as weight, standing height, sitting height, foot length, fore leg length, thigh length, leg length and shoulder width are related to optimum and skillful performance in team as well as individual sport.

1.4 ANTHROPOMETRICAL EFFECT

Anthropometry constitutes the earliest form of measurement in physical education, as one might surmise. Study of the human physique and its proportions began many centuries ago. The early beginnings can be traced to the remote civilization of India, where a treatise called “Slip Astir” analyzed the outline of the body by dividing it into 480 parts. Anthropometry evolved in the quest to determine the ideal body proportions, and artists and sculptures directed their study to it as shown by the artwork of early civilizations. Artists comprised the chief workers in anthropometry unit 1835 when a mathematician in Brussels, Baron Quenelle, applied purely mathematical methods to discover the physical constants of the human body and proved that the binomial law (law of chance) applies to human proportions. This finding was confirmed about 50 years later by Sir Francis Galton, who systematically
analyzed measurement of certain physical constants of English men and women. In 1854, a German named Cares proposed an anatomical basis to determine body proportions. Shortly after this, Easing in Belgium and Cromwell in England studied the growth of school children. (Clarke and Clarke, 1989)

The first application of anthropometry in physical education began with Dr. Edward Hitchcock in 1861, when he undertook a study of anthropometrical measurements of Amherst College Men, leading to the publication of anthropometrical tables almost annually for 40 years. The aim of anthropometry was depicted by Hitchcock as ascertaining the ideal or typical man as a guide in fostering the development of normal individuals. He provided his students with a chart showing average results associated with different variables, against which the student might plot his own results. In 1886, Sergeant published an anthropometric chart based on 6 years of examining Harvard students. Sergeant included lung capacity and certain strength measurements along with various measures of physical proportion and expressed the results in percentiles. From 1885 to 1900, anthropometrical studies were conducted at different collegiate institutions involving close to 8000 men and women. In 1890, Saver published what proved to be the pioneer American book on physical measurements of the body, it was subsequently revised twice. (www.en.wikipedia.com)

Anthropometrical measurement for assessment of physical status was expanded quite naturally to include consideration of body types and the relation of
physique to one’s health, immunity from diseases, posture, physical performance and personality qualities. It soon became recognized that a single ideal physique was both impractical and unrealistic. Actually Hippocrates first realized that fact and classified human beings according to two basic physiques – long and thin, or short and thick. Kretschmer, the father of modern body or somatotyping, defined three types by adding an in between and referred to them as asthenic (lean), athletic, and Pyknic (heavy) (Clarke and Clarke, 1989).

The following anthropometric measurements which were considered for the purposes of this study:

1. Height
2. Hand Span
3. Arm Length
4. Arm Girth

1.4.1 HEIGHT

Height is the measurement of the length of the human body, from the bottom of the feet to the top of the head, when standing erect. When populations share genetic background and environmental factors, average height is frequently characteristic within the group. Exceptional height variation (around 20% deviation from average) within such a population is usually due to gigantism or dwarfism, which are medical conditions due to specific genes or to endocrine abnormalities.
In regions of extreme poverty or prolonged warfare, environmental factors like malnutrition during childhood or adolescence may account for marked reductions in adult stature even without the presence of any of these medical conditions. This is one reason that immigrant populations from regions of extreme poverty to regions of plenty may show an increase in stature, despite sharing the same gene pool.

The maximal height that an individual attains in adulthood is not maintained throughout a long life. Depending on sex, genetic, and environmental factors, shrinkage of stature may begin in middle age in some individuals but is universal in the extremely aged. This decrease in height is due to such factors as decreased height of inter-vertebral discs because of desiccation, atrophy of soft tissues, and postural changes secondary to degenerative disease. (Kamadjeu et.al. 2006)

1.4.2 HAND SPAN

Hand span is reach the physical measurement of the length from one end of the finger (thumb finger) to the other finger (little finger) when the hand fingers were spread to the maximum possible.

An above-average hand span is advantageous in sports such as handball. This would enable the player to have more grip on the ball and helpful to score the ball accurately and forcefully. (Tan, 2008)
1.4.3 ARM LENGTH

Arm length is measured by reposition the end of the measuring tape to a spot about 5 inches from one end of the rod. Grasp the rod and hold in the arm at about 45 degrees from the midline of the body The elbow must be extended fully during this measurement. The arm length is the distance from the rod to the acromion process. The acromion process is the bone like protuberance at the edge of the shoulder.

Arm length is advantageous in sports such as handball, basketball, boxing, and swimming. This unusually long reach allowed players to propel, dribble and shoot effectively than others. (Kamadjeu et.al. 2006)

1.4.4 ARM GIRTH

The circumference of the arm at the midpoint between the acromiale and the radiale when the subject is standing erect and the relaxed arm is hanging by the side.

The circumference of the arm, as a measure of the underlying musculature and adipose tissue. Girth measurements combined with skin fold measurements can give a clear picture of changes in tissue composition and distribution of muscle and fat. For the handball player, it is a measure of musculature and adipose tissue which is beneficial to show the muscular strength of the arm in passing, receiving, and shooting the ball. (Kamadjeu et.al. 2006)
1.5 PHYSICAL FITNESS

According to Oxford dictionary (1988) the word Physical stands for ‘of the body’, ‘physical fitness’, a physical examination.

Physical fitness is a combination of qualities that enable a person to perform well in vigorous physical activities. These qualities include agility, endurance, flexibility and strength. Physical fitness and good health are not the same, though each influences the other. (*The World Book Encyclopedia, 1993*)

The physical preparation of the athletes mainly depends upon the physical exercises which are aimed at improving physical fitness levels of the athletes.

Fitness is a key to enjoy life. Exercise is an important of a total fitness programme. Modern living has taken all the exercise out of our lives and so in order to get fit and have to put it back again, regular exercise is necessary to develop and maintain an optional level of health, performance and appearance. It makes feel good, both physically and mentally. It gives psychological lift and strengthens a sense of accomplishment. Looking young is a reflection of good health. Regular physical exercise enhance the function of the joints, increase the sense of physical well-being and promotes a sense of feeling good, increases physical working capacity by increasing cardiorespiratory fitness, muscle strength and endurance and decreases the risk of serious diseases that could lead to early disability and death. (*Bill Tancred, 1987*)
Hardayal Singh (1996) express that exercise has shown to improve health prospects in various ways. It helps to reduce body fat and overall weight and reduce blood pressure. Exercise ensures better digestion, respiration and efficient blood circulation. Proper exercise programme can reduce the probability of injuries among older people as well as back injuries among certain occupational group. Exercise tolerance is increased, risk factors are controlled and even progression and regression of coronary artery disease can be influenced by training and diet. Psychological effects include lessened depression and reduced anxiety. Regular physical activity is important for maintenance of health and may lead to a better quality of life. Training has to be followed not less than two to three hours per week in at least three sessions at an intensity corresponding to 60 to 85% of maximum heart rate achieved in a symptom limited maximum exercise test. Cardiac patients at high risk should exercise at lower intensities. Exercise occupies a leading role in keeping persons fit. It will be quite difficult to adjust one’s life in term of stress, diet, sleep and so on without proper exercise. Exercise means using and tuning the body. Exercise builds and maintains physical fitness.

1.6 IMPORTANCE OF PHYSICAL FITNESS

Every individual must know the need of physical exercise. Physical fitness is the capacity of a person to function steadily and smoothly when a situation arises.

Physical exercises makes one mentally sharpen, physically comfortable and ease with his body and better able to cope with the demands that everyday life makes upon him.
Increased physical fitness not only improves health but improves performance at work. Hundreds of American companies have backed this idea financially by employing full-time directors of fitness for their work. (Hardyal Singh, 1996).

Physical exercise helps an athlete to possess a high degree of physical conditions. The following physical fitness variables, which were more associated with playing ability of the handball players were considered for this study:

1. Hand Grip Strength
2. Speed
3. Leg strength
4. Endurance
5. Agility

### 1.6.1 HAND GRIP STRENGTH

Grip strength is the force applied by the hand to pull on or suspend from objects and is a specific part of hand strength. Optimum-sized objects permit the hand to wrap around a cylindrical shape with a diameter from one to three inches. Stair rails are an example of where shape and diameter are critical for proper grip in case of a fall. Other grip strengths that have been studied are the hammer and other hand tools. In applications of grip strength, the wrist must be in a neutral position to avoid developing cumulative trauma disorders (CTD's).
Grip strength is a general term also used by strength athletes, referring to the muscular power and force that they can generate with their hands. In athletics, it is critical for rock climbers and in competitions such as the World's Strongest Man. Grip strength training is also a major feature in martial arts, and can be useful in various professions where people must work with their hands. (Mathiowetz, 1985)

Hand grip is an important, though often overlooked, component of strength in sports. However, the grip strength is most often a secondary or auxiliary function of the sport. Sports in which grip strength are included within the secondary focus include the following: climbing, horse racing, judo, brazilian jiu-jitsu, weightlifting, Fencing, and arm wrestling and baseball, as well as tennis. In Handball, hand grip strength plays vital role for the performance in the game especially for shooting.

1.6.2 SPEED

Speed is the quickness of movement of a limb, whether this is the legs of a runner or the arm of the shot putter. Speed is an integral part of every sport and can expressed as any one of, or combination of, the following: maximum speed, elastic strength (power) and speed endurance.

Speed abilities are trainable to a very limited extent due to its marked dependence on the functioning of the central nervous system. In practice, therefore, speed performance are commonly improved not directly by improving the
functioning of central nervous system but indirectly by improving the various factors on which the speed performance depends. It is, therefore, of great practical importance to know the factors which determine speed performance. (Hardayal Singh, 1991).

1.6.3 LEG STRENGTH

Strength is the ability to overcome resistance or to act against resistance. Strength should not be considered a product of only muscle contractions. It is in fact, a product of voluntary muscle contractions caused by the neuro-muscular system. (Hardayal Singh, 1996).

Strength, or the ability to express force, is a basic physical characteristic that determines performance efficiency in sports. Strength is a conditional ability, that is, it depends on the energy liberation processes in the muscle. Strength is also perhaps the most important motor ability in sports as it is a direct product of muscle contractions. All movements in sports are caused by muscle contraction and, therefore, strength is a part and parcel of all motor abilities, technical skills and tactical actions. Strength and strength training, therefore, assume high importance for achieving good performance in all sports.

Leg strength has been considered as the most important conditional ability. It has been the most significant factor to enhance sports techniques and performance. Since all sports movement are created by the contraction of muscle, therefore, leg
strength is an important component of various conditional abilities, skills and tactical actions. (Uppal 2001)

1.6.4 ENDURANCE

Endurance, like strength, is a conditional ability. It is primarily determined by energy liberation processes. The ability of the human body to maintain a certain level of energy production forms the physiological basis of endurance. Due to its high importance for health and training and competition and also due to its physiological determinants, which can be relatively easily studied, it is an ability which has been studied in great detail and depth by the physiologists. Endurance is directly or indirectly of high importance in all sports.

Clarke and Clarke (1987) defines endurance as the ability to resist fatigue. “Endurance is the ability to do sports movements, with the desired quality and speed under conditions of fatigue”. The endurance training results in the improvements of functioning of various organs and systems of the human body. This, in turn improves the ability to recover quickly from training and competition load.

1.6.5 AGILITY

Agility is the ability to change direction of the body and its parts rapidly. Agility is a combination of several athletic trails including strength, reaction time, speed of movement, power and co-ordination. Agility is very important in all activities involving quick changes in direction are fundamental to foot performance
in practically all court games such as basket ball, tennis, badminton, volley ball and in many field games such as hand ball, soccer, speed ball and basket ball. These games require running agility. Agility either general or specific can be improved by increasing the athletic components. (Phillip 2001)

1.7 PHYSIOLOGY

Physiology is the science of functioning of all the organs and systems of an organism. For the physiological system of the body to be fit, they must function well enough to support to specific activity that the individual is performing more over different activity make different demands upon the organism with respect to circulatory, respiratory, metabolic and neurologic process which are specific to the activity.

In physiology, one learn how the organs, systems, tissues, cells and molecules within cells work and how their functions are put together to maintain the internal environment. Physiology is the science dealing with the study of human body functions. Exercise physiology is the study of how body’s structures and functions are changed as a result of exercise. It applies the concept of exercise physiology to training the athlete and enhancing the athlete’s sports performance. (Ajmer Singh, 2005)

Exercise physiology is the scientific study of physiological changes in athletes body with the effects of exercise, whether long term or short term. Different
environmental changes, namely, altitude, climate, temperature, humidity, nutritional status etc have some close associations with the optimal performance of an athlete. (Clarke and Clarke, 1987)

For the physiological systems of the body to be fit, they must function well enough to support the scientific activity that the individual is performing moreover different activity make different demands upon the organism with respect to the circulatory, respiratory metabolic and neurologic processes which are specific to the activity.

1.8 IMPORTANCE OF PHYSIOLOGICAL VARIABLES FOR PLAYING ABILITY

High level of performance in sports and games might be dependent upon the physiological make up and it was recognized that physiological proficiency was needed for the high level performance. How much athletic ability present in a particular person is attributable to genetics, and how much is determined by training and other adaptations made by the athlete.

Certain body types are well suited to particular types of athletic functions and movements. The Rift Valley of Africa, which includes countries such as Kenya and Ethiopia, has produced more world- and Olympic-champion distance runners than any other place on Earth, due to the slender, relatively long-striding people of that district, who live at altitudes in excess of 6,562 ft (2,000 m). These physical
attributes have created a superlative human form for distance running. The people who live near the Baltic Sea in northeast Europe, including Lithuanians and Russians, possess tall, lean, muscular frames, ideally suited to sports such as basketball. These two examples are based on a broad range of experience and athletic success that these groups have enjoyed in the stated sports. (Shaver Larry.G. 1982)

The conflict between how much athletic ability is rooted in individual genetics as opposed to the influence of training and other factors is often expressed as "nature versus nurture." Although precise attribution between athletic nature and nurture are impossible, it is a generally accepted sport science proposition that genes represent approximately 50% of athletic variation in performance, with 50% attributable to both the individual athlete's response to training, as well as social factors, such as the support provided to the athlete in pursuit of his or her goals.

An example is the very tall northern European male, who at a height of 7 ft (2 m) would seem to be a far more attractive recruit to the sport of basketball than a person 5 ft 10 in (1.7 m). The gene-governing height present in the taller male represents a potential dominant physical factor, but never a determinative one, as height is but one component of basketball success. Coordination, agility, spatial sense, determination, resilience, and intelligence are all traits that are essential; each is one that may not be capable of development in an athlete, irrespective of height. The fact that a runner comes from the Rift Valley area of Africa, with the genetic
makeup that has been a basis for the multitude of successes for similar athletes in middle distances and the marathon, does not guarantee elite athletic status, as training and the determination to compete against similarly endowed and talented runners will spell the difference. (Shaver Larry.G. 1982)

There are a number of critical training factors constructed upon the inherent individual physical traits that will influence athletic success. The ability to increase one's maximum oxygen uptake, expressed as VO$_2$ max, is one such factor. A greater VO$_2$ max represents a correspondingly enhanced ability to convert the bodily fuel sources into energy. VO$_2$ max is a genetic characteristic that may be typically increased through training between 10% and 15%; exceptional athletes have experienced VO$_2$ max gains of 30%.

As a further example of the interrelationship between genetic makeup and training determination, studies with elite endurance athletes such as cyclist Lance Armstrong confirm that intense, long-term endurance training will modify the ratio of fast-twitch, explosive muscle fibers and slow-twitch, endurance fibers present in the musculoskeletal structure, producing more useful sport-specific muscles. (Shaver Larry.G. 1982)

It is also apparent that the importance of genetics in the prediction of athletic performance is less pronounced when the sport requires the development of a specific set of technical skills, placing primary emphasis upon efficient technique and error-free
For specific physiological systems of the body to be fit, they must function well enough to support the particular game that the player is playing. Since different games make different demands up on the organism with respect of neurological, respiratory, circulatory and temperature regulating functions physiological fitness is specific to the activity. Physiological systems are highly adaptable to exercise.

For the purpose of this study, the physiological variables, mean arterial blood pressure, vital capacity, resting pulse rate and breath holding time were considered.

1.8.1 MEAN ARTERIAL BLOOD PRESSURE

As blood is ejected into the aorta and other arteries during ventricular system, the pressure increased to a maximum called systolic blood pressure. The pumping rate of the heart various under conditions like long duration of work without rest, food intake, age and emotion. The pulse rate corresponds with the cardiac cycle, if the pulse count is 72, the cardiac cycle will occur 72 times in a minute.

As blood drains from the arteries during ventricular diastole, the pressure decrease to a minimum called diastolic blood pressure. Diastolic blood pressure is the lowest arterial blood pressure of the cardiac cycle occurring during diastolic of the heart. Based on diastolic and systolic blood pressure mean arterial blood pressure is determined. (Guyton 2001)
1.8.2 VITAL CAPACITY

A pulmonary measure often used to represent the capacity of the lungs is vital capacity. It is a major fraction of the total lung capacity; it is defined as the largest volume of air that can be exhaled after the deepest possible inhalation. It probably represents a structural component of the body, similar to other anthropometric assessments of body size, since it is known to correlate well with a variety of strength tests in young boys. (P.J.Strukic, 1981)

1.8.3 RESTING PULSE RATE

Resting pulse rate which is the number of beats felt exactly one minute. The average rate of the pulse in a healthy adult is 72 beats in each minute. There may be variation of up to five beats per minute within the normal range. The number of beats of a pulse per minute or the number of beats of the heart.

The pulse rate or heart rate varies greatly among different people and in the same person under different situations. The American Heart Rate Association accepts as normal range from 50 to 100 beats per minute. The average rate is 72 beats per minute but the rate can accelerate to 220 per minute. The lesser pulse rate given good performance for all the sports and games. (P.J.Strukic, 1981)

1.8.4 BREATH HOLDING TIME

Breath holding time is defined as the duration of time through which one can hold his / her breath without inhaling and exhaling after a deep inhalation.
There are two types of breath hold time:

- Positive Breath holding time
- Negative Breath holding time

Endurance type of training will improve the breath holding time. Breath holding time also plays a vital role in the sports performance. (P.J.Strukic, 1981)

1.9 PSYCHOLOGY

The word psychology come from the Greek word psycho, means mind or soul and logs mean science. So the word psychology is the science of the mind and soul. Psychology study human nature science of the mind and soul. Psychology is the study of human nature scientifically and rather than formulate condition. Psychology plays a major role in sports and in closely associated with psychological components.

Sports psychology is defined as the scientific study of human behaviour in sport. Like the other discipline with in sports and exercise science, sports psychology can be applied to varied skilled movement physical activities and exercise programmes, such as corporate fitness, exercise rehabilitation and health oriented exercise programmes as well as traditional physical education and competitive athletics. (Diane L. Cell, 1972)
1.9.1 ANXIETY

While doing any job when one suspects about the proportion of possibility of success is known as anxiety. Anxiety is psychological factor which differs from arousal. It encompasses some degree of activation and an unpleasant emotional state. This form anxiety is used to describe the combination of intensity of behaviour and directional effect or emotion.

Anxiety plays an important role in the acquisition of motor skills as well as in athletic performance. Anxiety can either enhance or inhibit performance whether its effect is positive or negative depends on how an individual athlete perceives the situation.

People with low trait level have been known to perform better in selected motor skills than those with high or trait levels. There is also positive relationship between participants in athletic competition.

A moderate level of anxiety seems best for the acquisition and performance of motor skills levels of anxiety either too high or too low tend to inhibit learning and performance. (Diane L. Cell, 1972)
1.9.2 AGGRESSION

Any action intended to cause injury or anxiety has been described as aggression. Psychologists like Mc Dougal who has given so much importance to natural instincts have pleaded that aggression is being created through instincts.

Buris Husman (1955) says, “Aggression is behaviour which is developed through training”. The purpose of such aggression the achievement of the end product, namely physical or psychological injury

The main function of emotion is to provide mental power to physical actions. They cover all the bodily controls. As soon as a certain physical action is over or the purpose is served or the thinking is changed emotions get over, like some of elastic things. The concept is known as homeostasis. Aggression is also a time being emotion. Perhaps it might be such a status of the organism with its body mind and spirit, which make him work more enthusiastically. So the level of aggression needs to be of some specific limits. (Alagaonkar, 1997)

1.9.3 ACHIEVEMENT MOTIVATION

Motivation means move to achieve. In psychology the term motivation or motive refers to activation from within in the organism. The motivation is termed as the urge to push towards a specific goal. Motivation is a concept invented to describe the psychological state or the organism as it is affected by various influences. A person is motivated when he desires some goal, a goal that will meet
his need or satisfy his interest. Many psychologists believe that all behaviors are motivated, although it is extremely difficult to isolate specific motivational variables.

According to Alagaonkar, (1997) motivation as a personality characteristic related to the general state of arousal and subsequent level of attention paid to a problem or task facing of an individual. Level of achievement motives is positively related to success. Achievement related motives may be more successful in predicting behavior in sports selling.

1.9.4 SELF CONFIDENCE

Sports psychologists define self confidence as the belief that one can successfully perform or desired behaviour. The desired behaviour might be kicking a soccer goal, staying on an exercise regimen, recovering from a knee injury, serving an ace, or hitting a home run. But the common factor is that one believes that he will get the job done.

It is important to make a final comment about defining self confidence. Specifically, some evolving and recent research (Koole and Pelham, 2003) has revealed that like many other current personality constructs, self confidence may be multi dimensional, consisting of several aspects. Specifically, there appear to be several aspects, there appears to be several types of self confidence within sport including the following:

- Confidence about one’s ability to execute physical skill
Confidence about one’s ability to utilize psychological skill (e.g. imagery, self-talk).

Confidence in one’s level of physical fitness and training status

Confidence in one’s learning potential or ability to improve one’s skill

(Koole and Pelham, 2003)

For the purpose of this study, the psychological variables anxiety, aggression, self confidence and achievement motivation were considered.

1.10 HANDBALL PERFORMANCE VARIABLES

Handball is all about high speed and precise, quick passing and one of the more high octane sports at the Olympics. The key to success lies in players working together at high speed to move the ball up the court and they do so much quicker. In this study, the skills passing, jump shot right wing, jump shot left wing and shooting were used.

1.10.1 PASSING

Passing is a fast method of advancing the ball in front or beside a player by a series of easy and controlled passes in handball. The choice of a player has to make in a game situation is to pass.
Handball players are allowed to touch the ball with any part of their bodies above the knee (knee included). As in several other team sports, a distinction is made between catching and dribbling. A player who is in possession of the ball may stand stationary for only three seconds and may only take three steps. They must then either shoot, pass or dribble the ball. At any time taking more than three steps is considered travelling and results in a turnover. Though a handball player can dribble as many times as he wants, passing is faster and is the preferred method of attack. Therefore basketball-style carrying is completely prohibited, and results in a turnover. After the the picked up of the ball, the player has the right to another three seconds or three steps. The ball must then be passed or shot as further holding or dribbling will result in a "double dribble" turnover and a free throw for the other team. (www.en.wikipedia.org/wiki/team_handball)

1.10.2 SHOOTING

The final objective of every attack is to score a goal. Easier said than done, however in the real world one will feel to achieve the objective more often because scoring goals is the most difficult task in handball. To score goals on a regular basis one must be able to execute shooting skills. Under the game pressures of limited time, restricted space, physical fatigue, and aggressive opponents, the success as a goal scorer depends on several factors. One has to prepare himself to take advantage of scoring opportunity by practising shooting skills in situations that stimulate actual game conditions. There are different types of shooting in handball, namely, penalty
shot, jump shot right wing and jump shot left wing (www.en.wikipedia.org/wiki/team\ handball)

1.10.3 JUMP SHOT (RIGHT AND LEFT WING)

Jump shot is the most vital offensive skill in handball. This forceful insertion of the ball into opponents goal technique is done either from the right wing or from the left wing. Thus, handball players are typically referred by the position they are playing. The positions are always denoted from the view of the respective goalkeeper, so that a defender on the right opposes an attacker on the left. Left and right wingman. These typically excel at ball control and wide jumps from the outside of the goal perimeter to get into a better shooting angle at the goal. Teams usually try to occupy the left position with a right-handed player and vice versa. Thus, there are two types of jump shots in handball, namely, jump shot right wing and jump shot left wing. The players of right wing would be normally left handed and the players of left wing would be normally right handed. (www.en.wikipedia.org/wiki/team_\ handball)

1.11 REASONS FOR SELECTION OF TOPIC AND VARIABLES

Every one is eager to know about the future well in advance. Hence prediction plays a key role in the day-to-day affairs. The perfection in the prediction makes vast changes in the life style of many individuals in the outcome of their engagements.
Prediction are obviously sound if they prove to be correct one of the most important fruits of scientific investigation and one of the most exacting tests of any hypothesis is the provision, it makes for predictions. Prediction statistically oriented investigators make how they do not blind themselves to their failures but bring them clearly into the sight.

As an educationist and an economist predict certain things in their respective fields a person involved very much in sports and games also predicts the possible outcomes in sports and games. The coach is in a way competent person to do the predictions about the outcomes of the match to be played in future. This can be well observed in the selection of players based on their performance to meet the future emergencies in a play ground. A coach is actually exploiting the inherent abilities dormant in individual players.

Prediction and explanation of scientific factors can be justified as the most important aspect of applied researches. Prediction of an event that is to take place or prediction at top-level players can be determined accurately to a greater extent by taking a number of measures in various skills and parameters specific to a particular game.

Prediction can be defined as the act of foretelling about the future and present. As the educationist and the economist predict certain things in their respective fields a person involved in sports and games also can predict the possible out comes. (Mathews, 1978)
One way in which tests have been used with increasing frequency is as predictions of various aspects of motor behaviors. For many years coaches have been interested in tests to predict success in their sport. In some instances the prediction involved Olympic athletics, other efforts were directed to the college athletes. Efforts have also been directed to predicting long-term involvement in physical activity. In exercise physiology, scores on a fitness test might be used to estimate maximal oxygen uptake. The percentage at one’s body that can be predicted using indicators such as skin fold thickness tests. These are merely ten examples at the widespread use at tests as predictors in physical education and exercise science.

Prediction can be used for the purpose at evaluation, an athlete’s future success in a specific area or skill can be predicted using proper evaluation. The present status in a particular skill area is used to predict future success in that same area participates in various aspects can be advised into activities in which they have the greatest chance of success through prediction.

The investigator reviewed a number of scientific articles, books, journals and found that selected anthropometric, physical fitness, physiological and psychological variables play dominant role of the handball playing ability of the university level players. It was the matter of interest to predict the handball playing ability of the university handball players from selected anthropometric, physical, physiological, psychological and performance variables. Hence, the investigator selected the
research entitled “Prediction of handball playing ability from selected anthropometric, physical, physiological, psychological and performance variables of university handball players”. For the purpose of this study, the investigator subjectively determined the handball playing ability of the university handball players and selected anthropometric variables, height, hand span, arm length and arm girth. The physical fitness variables selected were hand grip strength, speed, leg strength, endurance and agility. The physiological variables selected were mean arterial blood pressure, vital capacity, resting pulse rate and breath holding time. The psychological variables selected were anxiety, aggression, achievement motivation and self confidence. The handball performance variables passing, jump shot right wing, jump shot left wing and shooting were selected.

1.12 STATEMENT OF THE PROBLEM

The purpose of this study was to predict the playing ability in handball from selected anthropometric, physical, physiological, psychological and performance variables among inter university level men handball players.

1.13 HYPOTHESIS

Keeping in mind the statement of the problem the following hypothesis were formulated.

1. It was hypothesized that the anthropometric variables, height, hand span, arm length and arm girth would be predictors for handball playing ability.
2. It was hypothesized that the physical fitness variables, hand grip strength, speed, leg strength, endurance and agility would be predictors for handball playing ability.

3. It was hypothesized that the physiological variables mean arterial blood pressure, vital capacity, resting pulse rate and breath holding time would be predictors for handball playing ability.

4. It was hypothesized that the psychological variables, anxiety, aggression, achievement motivation and self confidence would be predictors for handball playing ability.

5. It was hypothesized that the performance variables, passing, shooting, jump shot right wing, jump shot left wing would be predictors for handball playing ability.

6. It was hypothesized that handball playing ability of the inter university handball players can be predicted successfully from the selected anthropometric, physical, physiological, psychological and performance variables.

1.14 SIGNIFICANCE OF THE STUDY

In the recent years physical educators, coaches, sports experts and even most of the players have realized the importance of playing ability. The significance of
the study is based on the fact that playing ability can be predicted from selected anthropometric, physical, physiological, psychological and performance variables.

Maximum degree of skill development and physical fitness are required to be mastered for outstanding performance.

1. This study will help to evaluate and compare the abilities and capacities of the handball players by themselves, coaches and physical educators.

2. The result and findings of this study would provide criteria for selecting potential handball players.

3. This study might be utilized as a screening instrument in analyzing and classifying the handball players.

4. The outcome of the results shall be helpful to handball coaches and physical educationists to concentrate at the selected predicted variables of this study, which might be having high correlation with performance, to design the training programme.

5. The result of the study would be making it clear whether the selected predictor variables are directly or indirectly related to the criterion variables.

6. The result and findings of this study, may guide handball players on their playing ability.
7. This study will help the budding researchers to take up similar studies in other areas and disciplines.

1.15 DELIMITATIONS

The study was delimited in the following ways:

1. This study was confined only hundred inter university handball players who participated in the South West Zone Inter University Tournament during the year 2007-08 held at Acharya Nagarjuna University, Guntur, Andhra Pradesh.

2. The subjects selected were in the age group between 17 and 25 years.

3. The study was conducted on the selected anthropometric variables, namely, height, hand span, arm length and arm girth.

4. The study was limited the term “physical variables” to import bodily characteristics including fitness variables essential for handball players, namely, hand grip strength, speed, leg strength, endurance and agility.

5. The study was delimited to physiological variables, mean arterial blood pressure, vital capacity, resting pulse rate and breath holding
time and psychological variables, anxiety, aggression, self confidence and achievement motivation.

6. The predictor performance variables selected for this study were passing, jump shot right wing, jump shot left wing and shooting.

7. The handball playing ability was determined subjectively by experts in a six versus six playing situations.

1.16 LIMITATIONS

This study is limited in the following aspects and these limitations have to be taken into considerations.

1. The students were from different social, cultural and economical status which was taken as a limitation for this study.

2. Heredity and environmental factors which contribute to performance have not been controlled.

3. No effect would be made either to control or to asses the quality of the food ingested, life style, effect of metabolic functions as these are recognised as a limitations for this study.

4. No other motivational technique were followed to assess selected physical, physiological, psychological and performance variables.
1.17 DEFINITION OF TERMS

1.17.1 Prediction

Prediction is estimating a person score on one measure based on the persons score on one or more of other measures. (Baumgartner, T. A and Jackson, A.S. 1987).

1.17.2 Anthropometrical Variables:

Anthropometric variable are dimensions of the structure of human body taken at specific sites to give measures of length, girth and width. (Mathews and Fox 1985)

1.17.3 Height

The height of the subject is measured in centimeters while standing in erect position. The measuring scale used as a stadiometer. The chin of the subject and the head was held erect. The height was measured to the nearest centimeter. (Yobu, 2001).

1.17.4 Hand Span

Hand span is the distance from the tip of the thumb to the tip of the little finger in a straight line when the hand is wide open. (Clarke and Clarke, 1989)
1.17.5 Arm Length

The arm length was the distance from the rod held by the subject tightly in his hands to the acromion process. (Clarke and Clarke, 1989)

1.17.6 Arm Girth

It is the maximum circumference of the arm and was measured to the nearest centimeter at the bulkiest portion. (Clarke and Clarke, 1989)

1.17.7 Physical

According to Oxford dictionary(1988) the word Physical stands for ‘of the body’, ‘physical fitness’; a physical examination.

1.17.8 Physical Fitness

Physical fitness is the utilization of excessive calories by a cardiovascular and muscular process bringing the body to optimum efficiency. (Clarke and Clarke, 1989).

1.17.9 Hand Grip Strength

Hand Grip strength is the force applied by the hand to pull on or suspend from objects and is a specific part of hand strength. (Clarke and Clarke, 1989)

1.17.10 Speed

Speed may be defined as the capacity of an individual to perform successive movements of the same pattern at the fastest rate. (www.freeonlinedictionary.com)
1.17.11 Leg Strength

Strength is the ability to overcome resistance or to act against resistance. Strength should not be considered a product of only muscle contractions. It is in fact, a product of voluntary muscle contractions caused by the neuro-muscular system. (Hardayal Singh, 1991).

1.17.12 Endurance

Clarke (1989) stated that “endurance is basic in measuring organic capacity believing that if one is able to run or swim more than normal distance without undue fatigue he is in good physical condition”.

Endurance is the capacity to persist in strenuous tasks for some length of time.

The capacity to work under strain for a long period of time without undue fatigue

1.17.13 Agility

Agility is the ability to change directions quickly and control body movement. (Hardayal Singh 1991)

Agility is generally defined as the ability to change direction quickly and effectively while moving as nearly as possible at full speed. (Eckert 1974)
1.17.14 Mean Arterial Blood Pressure

It is defined as the average arterial pressure during a single cardiac cycle.

As blood is pumped out of the left ventricle into the arteries, pressure is generated. The mean arterial pressure (MAP) is determined by the cardiac output, systematic vascular resistance and central venous pressure according to the following relationship, which is based upon the relationship between flow, pressure and resistance. (Mathews and Fox 1985)

1.17.15 Vital Capacity

The volume of air that can be moved out of the lungs after maximum inspiration is called vital capacity. (P.J.Strukic, 1981)

The maximal volume of air that can be forcefully exhaled from the lungs following a maximal expiration.

1.17.16 Resting Pulse Rate

The time from the end of one contraction to the end of the next contraction is a complete heart beat or pulse or cardiac cycle. The complete cardiac cycle takes less than one second (about 0.08 sec) in a normal adult at rest and it shortened by exercise. (Eva Lurie Weinerb, 1984).

1.17.17 Breath Holding Time

Breath holding time is define as the duration of time through which one can hold his breath without the study of all living things. (Laurence E. Morehouse and Augustus T.Miller, 1967).
1.17.18 Anxiety

Anxiety is a complex emotional state characterized by a general fear of bonding usually accompanied by tension. It often has to do with interpersonal relation social situation and feeling of rejection and insecurity and usually a part of anxiety. (Abrahamsen FE, et.al. 2008).

1.17.19 Aggression

Accidental harm is not aggression, but acts that are intended to injure others are aggression, whether or not they are successful. (Kamlesh, 1988)

1.17.20 Self Confidence

Self confidence as the belief that one can successfully perform a desired behaviour. The desired behaviour might be kicking a soccer goal, staying in an exercise regime, recovering from a knee injury, serving an ace. But the common factor is that one believes that he will get the job done. (Kamlesh, 1988)

1.17.21 Achievement Motivation

Achievement motivation refers to the tendency to strive to achieve and excel in whatever challenge that is presented. And sports achievement motivation is defined as the tendency to strive to achieve and excel in particular game or sport. (Kamlesh, 1988)