CHAPTER-I
INTRODUCTION

Sport is as old as human society and it has achieved a universal following in the modern times. It has enjoyed a popularity, which outstrips any other form of social activity. It has become an integral part of educational process. Many participate in sports activities for the fun or for health, strength and fitness. It is taking the shape of profession, to some with high skills with ample financial benefits linked with high degree of popularity. The promotion of Sports and Physical education is no longer a matter of dispute. Their importance has been recognized at international level by all the countries of the world. Today, sports and physical education are considered as international disciplines because they develop international understanding and universal brotherhood. In the present politically conflicting times, the sports are also considered as one of the major adhesive forces for developing world peace.

Sports hold a prominent place in modern life. Millions of people participate in sport, watch and hear about them and spend billions, of dollars on sports related activities and equipments. This has led to the competitive element in sports, as now sportsmen participate to win and achieve laurels for them as well as for their country. In today’s ever advancing and professionally competitiveness best performance in sports can be made only through a systematic planned, executed and controlled training system, base on scientific system of sports training. Sports in today’s life plays very important role in bringing about physical, mental and social growth of nations. The sports scientists and the physiologists have been of the view that human capacity of performances among athletes had its limits in the method of standards of efficiency. But, this belief has been proved false and the barriers of performance have been surpassed by the athletes as result of continued improvement in the techniques, method of training and coaching.

Physical fitness has been of great significance in the lives of human beings from times immemorial. In the pre historic times, physical fineness was the key element for the survival of a human being. People during those times were confronted with hostile environment and only fit individuals could survive. Hence survival of the fittest was the dictum. Even the civilization of Sparta, Athens and Rome in the history of the world has stressed physical fitness or physical training as an important objective of the educational programme. Physical fitness is a matter of fundamental
importance to individual well being and to the progress and security of nation. It is the 
basis for all other forms of excellence. With increased mechanization there has been a 
corresponding decrease in the number of tasks that require an expenditure of energy, 
sufficient vigorous exercise are not done to develop and maintain adequate level of 
fitness. Various individual depends upon various form of exercise to attain an 
acceptable level of physical fitness.

In its most general meaning, physical fitness is a general state of good physical 
health. Obtaining and maintaining physical fitness is a result of physical activity, 
proper diet and nutrition and of course proper rest for physical recovery. In its 
simplest terms, physical fitness is to the human body what fine-tuning is to an engine. 
It enables people to perform up to their potential. Regardless of age, fitness can be 
described as a condition that helps individuals look, feel and do their best. Thus, 
physical fitness trainers, describe it as the ability to perform daily tasks vigorously 
and alertly, with left over energy to enjoy leisure-time activities and meet emergency 
demands.

In order for one to be considered physically fit, the heart, lungs, and muscles 
have to perform at a certain level for the individual to continue feeling capable of 
performing an activity.

At the same time, since what humans do with their bodies directly affects the 
state of mind, fitness influences to some degree qualities such as mental alertness and 
emotional expression. Physical fitness is often divided into the following categories in 
order for people to be able examine its components or parts. Particularly, physical 
fitness is judged by:

- Cardiovascular endurance: This is the ability of the body to deliver oxygen 
  and nutrients to tissues and to remove wastes over sustained periods of time.
- Muscular strength & endurance: Strength deals with the ability of the muscle 
  to exert force for a brief time period, while endurance is the ability of a 
  muscle, or group of muscles, to sustain repeated contractions or to continue to 
  apply force against an inert object.
- Flexibility: This denotes the ability to move joints and use muscles through 
  their full range of motion.
- Body composition: Considered as one of the components of fitness, 
  composition refers to the body in terms of lean mass (muscle, bone, vital 
  tissue, and organs) and fat mass. Actually, the optimal ratio of fat to lean mass
is an indication of fitness. Performing the right set of exercises can help people get rid off body fat and increase or maintain muscle mass.

In terms of the competitive aspects of sports also, there has, over the years, been a sea change, in terms of the manner in which they are played, practiced and perceived at the national and international levels. The standards and levels of endurance, fitness and performance displayed by sportspersons have improved exponentially; the number of competitive sports disciplines has increased with the inclusion of many games indigenous to various regions of the world and, with the massive growth and sophistication in the spheres of media and communications. The visibility of competitive sports has grown enormously. In tandem with these trends, there has been increasing emphasis on the creation of high quality infrastructure and employment of sophisticated technology in the conduct of sports events, with a great deal of attention being given to the development of advanced scientific and technical support systems for sportspersons. With all this, sports as an area of activity, has acquired vast new dimensions, with multi-faceted implications of an economic nature and business potential also. Increasingly, hosting of international events is also seen by countries and cities as a means of positioning and show casing themselves in the international arena as tourism, business and investment destinations; significantly, many countries/cities are using these events as an opportunity to revitalize the poorer areas of the cities. The phenomenal growth of satellite television has not only brought international sports events into the bedrooms of billion of viewers across the world, but in the process opened the doors for huge revenue generation through sale of broadcasting rights, advertising, etc. Equally importantly, these developments have a significant impact on the perceptions and expressions of national aspirations and pride, mass participation, and bringing communities together.

Physical and physiological characteristics of elite athletes are different among sports. In selection of athletes for a particular sport, the focus should be on those traits and abilities which have the most significant influence on sport performance, such as physiological and anthropometric characteristics. The anthropometric provide us with the foundations and the private information concerning the characteristics of motor, which contribute about the possibility of evolving to reach high level of performance and achievement, they are measurements on the components of fat, muscles and bones to give the coaches, during their processes of selection and training, a vision more deep and specialized of the effect of the compound operations and functional physical
contributing to the high levels of athletic achievement. It also considers specifications anthropometric grounds that must be rationalized through the selection in sports for its close association with the access of emerging and evolving the levels of sporting prowess and that because of their impact on the level of the emergence of the physical characteristics and skill and functionality necessary to achieve those high levels of activity sports specialist. As early as the 1920s, researchers were examining the potential of anthropometrical (e.g., height) and physiological (e.g., strength) measures as discriminating factors between athletes involved in different sporting events. The list of variables considered was wide-ranging, from simple consideration of age, height, and weight to more extensive studies containing many anthropometric measurements, somatotyping, and tissue analysis. However, numerous studies have contrasted senior and junior athletes; relatively few have examined the characteristics of the 'world class' performer.

From as early as the 1928 Olympic Games in Amsterdam, researchers have explored the opportunity to examine the elite athletes. These studies have considered basic factors such as height, weight, and age to more extensive research on the size, shape, composition, and proportions of individual. Initially, researchers primarily concentrated on the dimensions of track and field athletes. However, as the number of events within the Olympics increased, so did the range of athletes studied. Although statistical analyses within these early studies were limited, data consistently demonstrated that, irrespective of the nationality of athletes, distinct profiles were evident for individuals in a range of different sporting events. The employment of the statistical procedure discriminant function analysis provided a unique contribution to the discussion of anthropometrical and physical differentiation. Tanner was able to identify groups of variables that best differentiated among athletes within different events. Consequently, distinct combinations of multiple measurements of anthropometrical and physical attributes were shown to be important for success within specific events:

“It seems that if you are large and have aspirations as a track athlete you have (always in general) a choice of the 400m, 110 m hurdles, 400m hurdles and 800m. If heavily muscled, that is built like a sprinter, 6 ft 2 in. and able to do 10.4 sec. for the 100m, then try the 400m. If a little slighter in muscle, and a little slower over the 100 m, then try the 800m, or else the 400 m hurdles. The ideal high hurdler should have long but powerful legs in relation to his body, powerful arms so that he can balance
the leg clearance movements and by reaction speed up the legs in their drive forward, and the skier's sense of rhythm”.

A number of studies provide information regarding physical fitness and anthropometric characteristics in various sports. The findings in most of these studies indicate significant differences in term of anthropometric and selected physical tests (sprinting, agility, vertical jumping, and aerobic power) between young athletes of different levels or elite and non-elite athletes of soccer, handball, hockey and volleyball. On the other hand, recent studies have shown no significant difference in vertical jump and velocity of movement in the contact game between highly skilled and less skilled rugby players as well as between winners and defeated karate players in anthropometric data and strength and vertical jump height, although winners tended to be more powerful in bench press and squat exercises. The importance of assessing sport-specific skills, as well as selected anthropometric and physiological characteristics in different sports, is vital to understanding sport performance, since the impact of high anthropometric and physical fitness qualities does not always transfer to improve playing performance. Studies have pointed out the importance of physical characteristics for different sports such as volleyball, rugby, and basketball. However, few studies in the literature have investigated physical and physiological characteristics of badminton.

Anthropometry has a rich tradition in sports sciences and sports medicine. Though, in different times, different terms were used like dynamic anthropometry, sports anthropometry, biometry, physiological anthropometry, anthropometrica, kin anthropometry etc. by scientists to establish some relationships between the body structure and the specialized functions required for various tasks (Koley, 2006). In fact, it is well established that each individual is unique. The extent of human variability is so enormous that no two individuals can ever be exactly the same. There are two fundamental causes for this variation. One is the genes inherited from parents and the other is the infinity of environment which acts upon individuals from cradle to grave. Therefore, scientists have always been fascinated by the phenomenon of human variation. In the populations, the law of chance operates as a whole and people in general tend to fall along a curve of normal distribution on all traits (Koley & Sandhu, 2005). With the innumerable variety of human physique, it has become a generalized consideration that some sports events are more suitable to individuals
with specific physique than others (Reco-Sanz, 1998; Wilmore & Costill, 1999; Keogh, 1999). It has been well established that specific physical characteristics or anthropometric profiles indicate whether the player would be suitable for the competition at the highest level in a specific sport (Claessens et al., 1999; Bourgois et al., 2000, 2001; Reilly et al., 2000; Gabbett, 2000; Ackland et al., 2003; Slater et al., 2005). These anthropometric and morphological parameters are the sensitive indicators of physical growth and nutritional status of the athletes for their maximal performances (Wilmore & Costill, 1999; Chatterjee et al., 2006).

Cricket is a field-based popular team game in most Commonwealth countries. In the past, it was played solely within a specific season (winter in Asian countries and summer in western countries). But the game has gained so much popularity in the last few decades that it is now played throughout the year. Cricketers are therefore exposed to more demanding schedules, with longer periods of training and practicing. The increased workload may be one of the contributing factors to the increased incidence of injuries (Davies et al., 2008). (Stretch, 1987) reported that provincial and international cricketers had a tall, athletic built, with definite morphological differences existing between batsmen, bowlers and all-rounders. The batsmen tended to be shorter and lighter, although possessing greater relative fat mass than the bowlers. The bowlers were found to be tall, with long legs, broad shoulders and a small amount of fat in the thigh and shoulder regions. The all-rounders had larger girth measurements and less relative fat than the batsmen and bowlers. The other characteristics of the all-rounders were similar to those of the other two groups. Again, studying the physical fitness profile of South African university cricketers, (Stretch & Buys, 1991) reported that although the cricketers were superior to sedentary subjects in the aspect of physical fitness, with the exception of flexibility, no significant differences existed between the batsmen, bowlers, all-rounders and wicketkeepers. Furthermore, no significant differences existed between the provincial and non-provincial cricketers.

The game of cricket has historically been known as "the gentleman's game". Until about three decades ago cricketers were certainly not the fittest athletes on the planet. Often it was remarked that cricket is physically an easy game which requires one to stand on the field for most of the day and requires little running, jumping or strength. However with the introduction of one day cricket, the game has gone through major changes and the physical demands made on a cricketer’s body have
also increased dramatically. No longer can a batsman just continue to defend away for overs, he has to often use his strength to hit big sixes. The highly developed levels of fielding in the modern times require a player to have strong shoulders and arms to make direct hits at the stumps. The modern player is leaner, stronger and far more athletic. For cricket enthusiasts there is nothing to match the meaningful contests and excitement generated by the game’s subtle shifts in play. Conversely, huge swathes of the world’s population find cricket the most obscure and bafflingly impenetrable of sports. The changing face of cricket attempts to account for this paradox. Traditionally, cricket has been perceived as a relatively mild sport from a physiological point of view. The intermittent nature of the game with its long rest intervals provides plenty of recovery time between any short spells of higher intensity activity. However, the demands of cricket may be underestimated. In one study of the 1999 South African world cup side, a number of physiological tests for explosive power and aerobic endurance capacity showed they were as 'fit' as the South African national rugby side.

Despite long history and global appeal, relatively little is known about the physical, physiological, anthropometrical and other requirements of cricket. It has been suggested that the physiological demands of cricket are relatively mild, except in fast bowlers during prolonged bowling spells in warm conditions. However, the physiological and anthropometrical demands of cricket may be underestimated because of the intermittent nature of the activity and the generally inadequate understanding of the physiological demands of intermittent activity and as a result this study was undertaken to find out the significant difference of anthropometric characteristics, body composition and physical fitness between cricketers and non cricketers were analysed.

STATEMENT OF THE PROBLEM

The purpose of the study was to compare the anthropometric characteristics, body composition and physical fitness between cricketers and non cricketers.

OBJECTIVES OF THE STUDY

1. To find out the significant difference of anthropometric characteristics between cricketers and non cricketers.

2. To find out the significant difference of body composition between cricketers and non cricketers.
3. To find out the significant difference of physical fitness between cricketers and non cricketers.
4. To find out the significant difference of anthropometric characteristics among cricketers of district, state and national level.
5. To find out the significant difference of body composition among cricketers of district, state and national level.
6. To find out the significant difference of physical fitness among cricketers of district, state and national level.

**DELIMITATIONS**

1. The study was delimited to 330 male subjects comprising of 165 cricketers and 165 non cricketers.
2. The study was further confined to the following selected anthropometric characteristics, body composition and physical fitness parameters:
   
   I. Anthropometric Characteristics:
      i. Standing height
      ii. Body weight
      iii. Leg length
      iv. Upper leg length
      v. Lower leg length
      vi. Arm length
      vii. Upper arm length
      viii. Lower arm length
      ix. Hip width (bitrochantric diameter)
      x. Shoulder width (biacromial diameter)
      xi. Chest width
      xii. Calf girth
      xiii. Thigh girth
      xiv. Chest girth
      xv. Upper arm girth
      xvi. Lower arm girth

   II. Body Composition:

   III. Physical Fitness Parameters:
      i. Speed
ii. Strength
iii. Agility
iv. Flexibility

3. The study was further delimited to the following levels of performances:
   i. District
   ii. State
   iii. National

LIMITATIONS

1. Certain factors like diet, rest, sleep etc. were beyond the control of the investigation and were considered as limitations of the study.

2. As the subject come from different socio-economic groups their dietary habits, life style, routine of study and play were different which were considered as limitations of the study.

3. No special motivation technique was used during the test, therefore the difference that may how occurred in performance due to lack of motivation was recorded as the limitation of the study.

4. The personal habits of the subject and their state of mind as well as emotional stresses and strains owing to work experiences were not being control.

HYPOTHESES

1. There may not be significant difference of anthropometric characteristics between cricketers and non cricketers.

2. There may not be significant difference of body composition between cricketers and non cricketers.

3. There may not be significant difference of physical fitness between cricketers and non cricketers.

4. There may not be significant difference of anthropometric characteristics among cricketers of district, state and national level.

5. There may not be significant difference of body composition among cricketers of district, state and national level.

6. There may not be significant difference of physical fitness among cricketers of district, state and national level.
DEFINITION AND EXPLANATION OF THE TERMS

Anthropometric Measurements:

- An anthropometric measurement is defined as dimensions of the structure of the human body taken at specific sites to give measures of length, girth and width.

Standing height:

- It is defined as the maximum height of the individual when standing erect on a horizontal surface with his head and face in Frankfurt horizontal plane or it is the straight height of the subject (bare-footed) up to the point vertex.

Body weight:

- Weight of the nude human body with empty bowels is known as body weight.

Leg length:

- The leg length has been measured from the greater trochanter (head of the femur) to the outside edge of the center of the foot

Upper leg length:

- It is measured from the Iliacspinale to Tibiae.

Lower leg length:

- It is measured from the Tibiae to the floor.

Arm length:

- The arm length was taken from the acromion process above the shoulder joint to the tip of the middle finger.

Upper arm length:

- It is measured at the upper edge of the head of acromiale to the tip of the top of the point of radial.

Lower arm length:

- It is measured at the upper edge of the head of the radius to the tip of the middle finger.

Hip width (bitrochantric diameter):

- It is the straight distance between the right and left trochanterion points. Trochanterion is the most superior and lateral point on the greater trochanter of the femur.
Shoulder width (biacromial diameter):
- It is the straight distance between the left and right acromial points. Acromial is the lateral most point on the superior and external border of the acromion process of the scapula.

Chest width:
- Subject stands erect with his arms initially raised and then lowered after the anthropometer is in place. The width of the chest is measured at the level of the nipples during normal breathing as a horizontal distance.

Calf girth:
- It is the maximal girth of the lower leg over the calf muscles.

Thigh girth:
- It is the girth of the thigh at a mid-point of femur length.

Chest girth:
- It is the maximal girth of the chest, which passes below the lower edge of the scapula and just under the mammilla in front.

Upper arm girth:
- The girth of freely hanging upper-arm measured mid-way between the point acromiale and the radial.

Lower arm girth:
- It is the maximal girth of the forearm.

Body Composition:
- Body composition refers to the proportion of fat and fat-free mass in the body.

Physical Fitness:
- Physical fitness refers to the organic capacity of the individual to perform the normal task of daily living without undue tiredness or fatigue having reserve of strength and energy available to meet satisfactorily any emergency demands suddenly placed upon him.

Speed:
- The capacity of individual to perform successive movements of the same pattern at the first rate.

Strength:
- Strength is defined as the force that a muscle or group of muscles can exert against a resistance in one maximum effort.
Agility:
• The speed with which an individual may change his body positions or fatness in changing directions while moving is known as agility.

Flexibility:
• It has been defined as the ability of a person to move the parts of the body through a wider range of motion as possible without undue strain to the joints and muscles attachments.

SIGNIFICANCE OF THE STUDY
1. The study will provide an understanding to the degree or differences in the anthropometric characteristics, body composition and physical fitness parameters among the cricketers and non cricketers.
2. The present study will provide a criterion of selection for the cricket players of different levels of performances on the basis of anthropometric characteristics, body composition and physical fitness parameters.
3. The findings of this study may add to the existing knowledge of physical educationist, coaches and to those who involve themselves in organization of sports and training.
4. The findings of this study might be of great help for the teachers of physical education and coaches to design the specific training programme for cricketers.
5. The study may throw light on various anthropometric characteristics, body composition and physical fitness parameters needed for good playing ability in cricket.