CHAPTER - I

1.1 General Introduction

Sports in the 20th century has occupied a dominant position in the area of human interest and the degree of dominance will be more and more in the new Millennium. One can well understand this from the sports pages of all the leading news papers reporting of the sports journals, radio and television coverage, Govt. interest and patronage over sports. Achievements in the sports performances are reaching new heights day by day and our knowledge about human capacity at the same time is getting newer dimensions exposing to searching inquiries in the field. Science and technology have brought a revolutionary change in all aspects of sports and games. Not only cinder and tartan tracks but also synthetic astroturfs, polygrass and the like are gradually replacing the natural playing surfaces. Use of anabolic steroids, packed r.b.c. male hormone in female, brake hormone, built -in shoes, fibre glass and other sophisticated equipments are boosting up natural human abilities. Today the more rich and technologically advanced the country, the more advantages its athletes reap in competitions.

Our involvement as spectators, participants and sponsors of sports has given an ideological support through the development of a belief system that outlines the supposed merits of sports. For example, it is popularly believed that sports builds character, provides outlets for aggressive energy, serves as the basis for group unity and solidarity and opens the door for formulation of friendly relationships between individuals and groups, our economy and our religious traditions. In all, sports has emerged as a relatively important element of our way of life
and has received the unquestioning support of the majority of our population\(^1\).

Throughout human history, a number of important changes have taken place in sports and a close look towards these changes will reveal that these changes were integrally related to the social, political and economic relationships between people in any given society. These changed relationship consequently brought about a shift of proper and along with this an inevitable change in the nature and organisation of games and sports activities.

Sports have never been as pervasive and influential in the lives of people as they are in the contemporary industrial society; never before have people had so much leisure time table to be filled up; and never before have sports been so closely linked to profit making, character building, patriotism and personal health. Modern sports have become a contribution of business entertainment, education, moral training and declaration of political allegiance. This, combined with sophisticated technology and a widespread search for challenges and exciting expressive experiences unavailable in the world of work, has made modern sports unique in sports history\(^2\).

The political implication of sports is that sports bring people together and foster unity and peace within and between nations. Sport is unique in creating social solidarity compared to art, literature, drama and music - each having the power to bring people together.


\(^{2}\) Ibid. p. 62.
The potential impact of sports on international relations has been described in many ways but it has never been summarised in more clearly than in the following statement by Alan Reich (1974), a former U. S. state Deptt. official:

"Sports open the doors to societies and key leaders. They pave the way for expanded contact - cultural, economic and political.

Sports provide an example of friendly competition and two-way interchange which hopefully, will characterise and lead to other types of friendly relations between nations.

Sports convey a person-to-person basis and through the media to the broader public a sense of commonness and interest shared with other people across political boundaries.

Sports enhance understanding of another nation's values and culture, so important but often absent in many forms of international communication.

Sports thus can help to improve perceptions of other peoples and to close the gap between myth and reality..."

There are several examples which prove that countries hosted international sports like Olympics and world competitions to achieve political gains of different nature such as giving the world visible proof of inner strength and vitality, setting high standard before the growing and challenging states, uplifting nation's spirit as a battle field victory, increasing international prestige, establishing diplomatic recognition by a majority of
states of the world, demonstrating superiority over other states in respect to culture, economic power, social system.  

History tells that sport and religion have had a changing relationship. Sometimes either religious ceremonies and festivals used to sponsor sport activities or, the church authorities endorsed them. It was believed that both religion and sports are grounded in a quest for perfection, both involve the integration of body, mind and spirit, both involve strong feelings based on intensive concentration.

A symbiotic relationship exists between modern sport and religion. People associated with religion have used sport as a means of achieving their personal and organisational goals and people associated with sports have used religion to achieve their goals.

According to Charles Prebish, professor of religious studies, religion provides athletes with a basis of reinforcement, both physical and spiritual. If allays psychological anxieties. It enables them to face the competition at hand confident and peaceful, fully concentrated. In addition an overwhelming number of athletes claim that religions conviction has been a profound factor in enhancing the development of sports skills. Coaches often tie up religion with sports in building team unity and motivating athletes to perform to the best of their abilities.

There is a very close relationship between sports and any culture. It is an accepted fact that the national character is not only expressed through its folklore, literature and art but also

through its unique sports culture. It has also so happened that some countries have linked their names with some games in such a way that the countries and the games both have almost merged together. For example cricket is always linked with England, soccer with Latin American countries and Hockey with India being the world champion for over a three decades at a stretch.5,6

Sports has became a big business. The growth of sports industry during the last half century has been phenomenal. In the United States Sports has become the twenty second largest industry which means Sports is bigger than the automobile, petroleum and air transportation sectors in U.S. economy.7

The emergence of corporate sport which is identified by the commercial interests of owners, sponsors and players, has greatly influenced the sports business in an economy. For example, Autoracing was largely created by the automobile manufacturers to promote, advertise and sell their products. Corporate houses also promote their products by sponsoring sporting events. Manufacturers of numerous products also sponsor stellar athletes to promote, advertise and endorse their products.8 Sponsoring of Wills International cricket competitions and appearance of Sachin Tendulkar on T.V. screen to speak for some commodities are examples.

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The sports disciplines for which competitions are held at different levels may be classified generally into two categories - individual sports and team sports.

The final performance in any competitive sports event depend on such factors as physical fitness, technique, tactics and skills although the relative contribution of these factors obviously varies from sport to sport. Additionally, some other factors like physique, body composition and psychological traits of the performer also play a vital role on performance. All these factors are not mutually exclusive of each other rather they are dependent on each other to ensure better performance. For example physique, body composition and psychological characteristics of the performer invariably influence the physical fitness status, technical and tactical abilities, and skills of the sports person. Again physical fitness on the other hand can influence body composition and behavioural pattern of the sports person. The most important of all these factors is physical fitness because high level efficiency in other factors is very difficult to achieve without high level physical fitness. So, it is highly essential that while selecting sports persons for any sports discipline, a relatively higher degree of weightage be given to physical fitness aspect.

Broadly the contributing factors to success in any sports are: Aerobic capacity, the ability to use anaerobic resources, balance, mobility, agility, speed, power, endurance of both repetitive and sustained type, skill, perfect technique, tactics, intelligence, hand-eye coordination, excellence in audiovisual ability, reaction time, perceptual motor ability, motivation, concentration, dedication, adequate rest, food, sleep, economic security, right coaching facilities, emotional stability, emotional support from family and
friends, specific physical preparation. These apart countless other psychological reinforcements and physiological factors do contribute for achievement. Quite naturally all athletes do not possess all these qualities. So the question inevitably crops up as to how young athletes are to be picked up when it is too early to identify their natural abilities. The answer lies in the predictive factors based on signs and symptoms exhibited by the athletes, which are tested, accepted or rejected through laboratory or field experimentation. There are various tests which can be administered on the predictive factors such as anthropometric measurements, height and body density at a given age, kinesiological and biomechanical assessment concerning the attachment, origin and insertion of muscles, their distance from joints producing mechanical advantages or disadvantages, intelligence motivation, stress and skill tests along with the whole realm of organic and motor fitness measures. After successful completion of the said tests on the required predictive factors, the young ones are caught, nurtured, coached, progressed, specially schooled, parents oriented appropriate environment created with the hope that the champions will eventually come out to uphold the nation’s pride in the field of sports and games.

An interesting area of study on futurism or futuristic which makes an attempt to scientifically examine the future has attracted us all. In the field of sports also sports scientists have been making the effort of predicting the success of the sportspersons during competitions. The prediction is usually based on a scientific study of the physical, physiological, anthropometrical and psychological factors of the sportspersons.
The variables that contribute to the successful performance in any sports event are broadly classified as physical, physiological, psychological and anthropometrical. Physical variables may be speed, strength, agility, flexibility, power, endurance, balance and coordination, body composition, kinesthetic perception etc. Some of the physiological variables are cardiorespiratory endurance, resting pulse rate, reaction time, response time, vital capacity, blood pressure, heart rate, anaerobic and aerobic power per kg body weight, body composition, peak flow rate, haemoglobin content etc. Psychological variables may be anxiety, intelligence, personality factors, attention, achievement motivation, sports self confidence, level of aspiration, competition anxiety, neuroticism extroversion, introversion, aggression, stress, fear, frustration etc. Anthropometric variables may be classified as---

(i) Linear measurements such as weight, height, sitting height, upper arm length, forearm length, hand length.

(ii) Diameters such as biacromial, bicristal femur bicondylar, humerous bicondylar.

(iii) Circumference such as chest, upper arm, thigh, calf.

(iv) Skin fold such as biceps, triceps, forearm, subscapular, midaxillary, suprailliac, thigh, calf etc.

Carter\textsuperscript{9} considered that the morphological characteristics of athletes are of interest to the human biologist for competitive sport demands the utmost from the body and it is, therefore, reasonable to expect to find in athletes a demonstration of the relationship of structure and function.

Parnell\textsuperscript{10} in an anthropometric study of athletes concluded that an individual’s choice of athletic events might largely be due to characteristics probably inborn. Tanner\textsuperscript{11} examined the physique and body composition of Olympic track and field athletes and inferred that the athletes were both born and made. The basic structure he stated “must be present for the possibility of being an athlete to arise. Physique is a factor in the success that may lead to inclusion in an Olympic team or more negatively that lack of proper physique may make it almost impossible for an athlete to reach that degree of success.”

Studies on physique play a very significant role in choosing a suitable physical activity for an athlete whose ultimate aim is to win the competition. The hurdlers for example have been found to have good height, long legs, short trunk, throwers having heavier and taller physique in the long muscular arms and wider shoulders, gymnasts being shorter and lighter. Again studies of body composition in certain sports indicated that athletes who were very lean but heavy because of a well developed musculature were found superior in certain competitive sports like football, weightlifting and shotputting.\textsuperscript{12} Obesity assessment can be usefully done by various methods of evaluating body composition. Percentage of body fat can be measured by skin fold measurements. As fifty percent of body fat is localised immediately under the skin, this skin fold measurement method can be considered to be one giving accurate assessment of body fat percentage. Considering high correlation between physical performance and body composition, the modern trend suggests.

\textsuperscript{10} Ibid.
\textsuperscript{11} Ibid.
\textsuperscript{12} Ibid, pp. 2-6.
inclusion of body composition measurement as one of the components of health related physical fitness test battery.\textsuperscript{13} Scientists and physiologists have been of the view that anthropometry and physical components of an athlete significantly influence performance and this is more than the techniques and tactics do to a player or a team. The research findings conclude that a high level technique perfection alone cannot do much to achieve success in competitive sports. Most of the sports events demand a greater amount of speed, strength, endurance, flexibility, coordination and maximum fitness of the organisms.\textsuperscript{14}

The champion athlete's performance is always impressive. It is interesting to identify the contributing factors of such outstanding performance Cratty holds that the contributing factors to an athlete's final performance are three:

(1) the basic behavioural supports underlying all performance,
(2) the person's physical ability traits, and
(3) the specific skills required in the relevant task.

Cratty describes the basic supports of behaviour as being such qualities as level of aspiration, need for approval, need for achievement, emotional stability and other various components of a person's personality and motivational structure\textsuperscript{15}.

Davey feels that the factors necessary for athletic excellence are skill, physical fitness and attitude\textsuperscript{16}.

\textsuperscript{16} Ibid, p. 6
Final performance in any competitive sports depends upon a number of contributing factors. Mainly four major groups of factors are:

1. the natural ability, capacity and physical endowment an individual receives via genetic inheritance.

2. the acquisition of specific skills required for excellence in a particular task or sport.

3. the specific type and level of physical fitness mandatory for that task or sports, and

4. the general psychological make up of the person in terms of his or her personality, motivational and emotional strengths. These
groups of factors can be depicted as follows. Singer indirectly presents a more sophisticated picture by structuring the basic dimensions of athletic performance into: (1) growth and development factors (2) Personality factors (3) personal factors (4) Social factors (5) practice factors (6) learning factors (7) training factors. An extremely simplified synthesis of these viewpoints could express athletic performance as being mainly dependent on four major groups of factors:

(1) the natural ability, capacity and physical endowment an individual receives in a genetic inheritance (2) the acquisition of the specific skills required for excellence in a particular task or sport (3) the specific type and level of physical fitness mandatory for the task or sport and (4) the general psychological make up of the person in terms of personality, motivational and emotional strengths.

All motor performance regardless of a person’s ability level is a function of the meshing of these four dimensions. Generally speaking, when each one of these groups of factors is at an optimum level in the person, his or her performance will also be optimal.17

It has now been well documented that mental training is an important adjunct to effective coaching programme. The sports Psychologists today contravene the Psychological barriers, strengthen the body, mind and spirit and help the athletes reach peak performance and they employ physio psychological and metaphysical techniques based on recent scientific findings. Today emphasis is given on brain/mind/ Spirit, the blend of these powerful elements for the Sports performer. and on some
techniques such as concentration, a practice which can bring the mind into focus at will; Stress management which eliminates the adverse effects of stress on performance; Nutritional balanced diet programme for improving strength and endurance upto 50%; Meditation, a natural, easy and spontaneous practice for removing Psychological barriers, opening energy channels and developing will power. Modern sportsperson must be satisfactorily trained in:

(a) Physical functioning- including skills, conditioning and diet.
(b) Mental control of anxiety, concentration etc.
(c) Inner spirit, the source of inspiration, enthusiasm, energy and more.

"In Olympic competition, a race is won in the mind ---- winning is 20% Physical and 80% mental". The person made this statement is Don Schollander winner of four gold medals during the 1964 Tokyo Olympics.

The value of Psychological training was proven by the Soviet in a study of four equally matched world class athletes.

Gr -I : 100% Physical training
Gr -II: 75% Physical training and 25% mental training
Gr-III : 50% Physical training and 50% mental training
Gr-IV : 25% Physical training and 75% mental training.

The conclusion of this study was:

Gr IV showed significantly greater improvement than group III and so on down to the least effectively trained Group I. The chief Soviet sport psychologist, V.A. Ramanov, summarizes their feeling on training. “the shaping of Psychological readiness is one
of the main tasks in preparing athletes for competition." When youngsters get to the national level they are all just about equal physically. So competitors from the very beginning should be trained physically, mentally and metaphysically.¹⁸

A series of Psychological concepts have been developed through research conducted by several Psychologists on diverse samples including young age group and University level athletes as well as world class performers, which can be fruitfully employed in the daily work of sports medicine physicians, coaches, trainers and physical educators with the ultimate objective to help the sports persons bring out the best performance. Some of the concepts are:

(1) Athletes from various subgroups differ on a variety of psychological states and traits.

(2) High level performers in athletics are characterised by psychological profiles which generally distinguish them from lower level performers. Successful athletes tend to exhibit extrovert behaviour with the major exception in case of marathoner and long distance runner who tend to exhibit introversion. Outstanding athletes have stable personalities in terms of the neuroticism - stability dimension and it is unlikely that unstable athletes can perform at a high level on a consistent basis. In terms of behavioural state, successful athletes tend to be less anxious, depressed and confused as well as possessing more vigour than the unsuccessful athletes.

(3) Attempts to elevate anxiety (Psyche-up) and reduce tension states should be used cautiously and employed on a personalised basis.

(4) Mental health plays an important role in athletic success and it is quite likely that "emotional first-aid following competition is just as important as Physical first-aid.

(5) There is frequently a lack of congruence between the athlete's conscious and unconscious motives.¹⁹

The selectors today considers psychological variables giving much weightage while selecting top level athletes along with considering physical and physiological variables. Psychology as a behavioural science has occupied a very important place and has established its contribution in the field of sports. It has helped both the coaches and the athletes to work efficiently in their respective fields of coaching and learning respectively²⁰. Recently the sports psychologists are becoming more and more interested to study the effect of anxiety level on motor performance. They have experienced through observation that it is the athlete's ability to cope with perceived stress level in competitive situations, that makes the difference in performance among the athletes of relatively equal athletic skills. Anxiety being fuelled by uncertainty and worries in the competitive situations disrupts the cognitive control and adversely affect sports performance²¹.

Sports psychologists today strongly feel that along with physical and physiological preparation, the athletes must be prepared mentally. A renowned sports psychologist as well as a performance consultant remarks that one of the major breakthroughs in sports will be in mastering the mental side of the game. In selecting the athletes, coaches often give efforts to search athletes who are "hungry, aggressive and a competitor". The legendary football coach Joke Gaither in search of athletes, always wanted those who were "mobile, agile, and hostile". Case study of top level performers reveals that intelligence and creative thinking had given them an edge over their fellow competitors. The positive correlation between intelligence and superior motor skills and the theory of "Psychokinetics" developed by Le Bouch provides a strong rational basis for employing suitable intelligence test as one of the contributing factors in the selection of top level sportsperson. According to Miroslav Venck physical factors prevail in training and psychic efforts prevail at competition. Apart from ensuring physical fitness and functional abilities which are measured by arterial pressure, pulse rate, ergospirometer, dosimeter, coefficient of resistance, breath holding tests, control of strength in all forms electrocardiogram, reaction time etc., intelligence tests and selected psychological tests will definitely give advantage in relating top level sportspersons. Anthropometric variables, somatotype characteristics and racial traits are added advantage and may be useful in guiding athletes to disciplines and events advantageous to them.

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between different levels of athletes in some sports open another area of interest for the psychologists, coaches and physical educationists. Coaches often make their remark that more successful participants are highly competitive and capable of leadership whereas less successful athletes have poor competitiveness, however the researches have provided conflicting results. Jhonson, Hutton and Jhonson²⁴ evaluated the personality traits of twelve national champions and concluded that champions are aggressive, highly anxious, possessed high level intellectual aspiration and exceptional feeling of self assurance. Biddulph²⁵ also reached the same conclusion in his study on high and less skilled athletes.

Kroll²⁶ on the other hand found very little or no difference between highly skilled and less skilled athletes. A number of studies have established that there are certain personality traits which distinguish the athletes from non-athletes or outstanding athletes from average athletes. Some personality factors that make these differences are: Sociability, dominance, extroversion, self concept, conventionality, mental toughness and emotional stability. The studies conducted by Carter and Shemon²⁷, Schendel²⁸, Warner and Cortheil²⁹, Behrmann³⁰ and Ikegami³¹ show

²⁴ Warren Jhonson, Daniel Hulton and Granville Jhonson “Personality Traits of some champion Athletes as Measured by Two Projective Tests” Research Quarterly 25 (December 1954) : 484.
²⁸ H.A. Schendel, “Psychological Differences Between Athletes and Non-Participants in Athletics at Three Educational Levels” Research Quarterly 38 (March 1965) : 52-67.
that athletes tend to be outgoing and socially confident to a significant degree. Sperling\textsuperscript{32} found extroversion to be highly related to dominance and sociability in athletics and sport participation. Other studies done by Burnner\textsuperscript{33}, Kane\textsuperscript{34} also gave the similar results.

The present study is an investigation of some predictive factors on the basketball players. The game of Basketball has emerged today as one of the most exciting popular games in the world of sports. Although this game was invented by Dr. James Naismith in 1891, it appeared as one exhibition game only in the Olympic game of St. Louis in 1904 and also in the Paris Olympic in 1924 and Amsterdam Olympic in 1928. This game was included as a competitive event in the Berlin Olympic in 1936 and women took part for the first time in Montreal Olympic in 1976. In 1910 Dr. John Henry Grey, the Director of Physical Education of the Calcutta YMCA College introduced Basketball game for the first time in India and it was at Calcutta in West Bengal\textsuperscript{35}.

\textsuperscript{32} A. P. Sperling, "The Relationship Between Personality adjust and Achievements in Physical Activities" Research Quarterly 13 (May 1942) : 352 -363.
\textsuperscript{34} J. E. Kane, "Personality and Physical Abilities Contemp Psychological Sports (Chicago athletic Institute 1970) cited by Grey, What Research tells the coach about Tennis, p. 7.
\textsuperscript{35} Amiyo Saha, Sarir - Sikhsar Ritiniti (Gupta press : 1984), p. 140.
The basic skills used by the players in a Basketball game are catching and passing the ball, dribbling, shooting and guarding the opponents. Playing ability in the game depends on proper application of these skills in the form of individual and team tactics. Most of the Basketball skill tests quite obviously include items for measuring the skills of passing, dribbling, and shooting in simulated game conditions.

Although the playing area of the Basketball game is relatively a smaller area, the nature of the game demands each player to make maximum exertion by doing repeated short-sprints with a sudden stop and changes in direction during the entire game period with a little rest in between.

In order to exhibit the top level performance in Basketball game, emphasis should be laid during training period of the basketballers on dynamic fitness, endurance development and motor skill fitness (strength, speed, coordination, flexibility, agility, power and balance).

Physiological variables such as cardiovascular efficiency, body fat percent, pulse rate, reaction time, movement time, blood pressure, vital capacity and others should be given due weightage at the time of selecting basketball players. Cardio respiratory endurance is considered as one of the important variables for efficient performance in basketball game as a basketball player has to make non-stop continuous movement during a competition. Cardio respiratory endurance enables a person to make for a prolonged period of time without undue

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fatigue with the help of oxygen which is collected, transported and utilised by lungs, blood and muscles respectively. Physical activity of any nature is directly related to energy supplying systems which in turn is the cardiorespiratory endurance of an individual.

High level basketball performance not only requires some qualities of physical fitness like speed, endurance, explosive power, agility, flexibility, strength etc. but also physiological structure. In addition to the techniques and tactics of a player or a team, physical and physiological characteristics help the performer for better performance.

As running, jumping, stopping and pivoting give a considerable amount of strain on legs and feet muscles, a strength programme is a must in the training schedule of a basketball players. Again since a basketball player is required to make frequent forward and backward movement, repeated jumps at the time of shooting and taking rebounds from the backboard along with fastbreaks, power is another important variable to be developed by a basketball player through a well planned training programme.

Some researchers have claimed that a high level of general fitness coupled with motor abilities like strength, aerobic endurance, speed of movement, jumping ability, agility, flexibility etc. are the essential qualities a basketball player is required to develop for high level performance.

In top level competitions the basketball court is mainly dominated by the tall players both in the offensive and defensive play. The players have to make the quickest movement to take advantage both in offensive and defensive skills over the
only the versatile and shrewed players can manoeuvre the modern techniques, tactics and strategies in a game and for this a harmonious coordination of all the motor skills is to be developed in a basketball player to perform all the movements needed for the game. Success in modern basketball game is not the outcome of skill alone but it is the product of the combined display of power, shrewdness and ability. Competitive situations demand concentration, quick thinking and decision making and a quick movement. The speed of the game is nothing but the players ability to think quickly about the attack and defence of the game at the same time.

Application of science and technology has brought about a revolutionary change in the standards of human performance in different disciplines of sports. Today athletes are trained following scientific principles of coaching and training, using the most sophisticated equipments and technology in order to bring out the best performance with least expenditure of energy and time. Researches in sports science such as biomechanics, sports and exercise physiology, sports psychology, sports sociology, Anthropometry are greatly influencing the techniques and tactics of sports and games and side by side the performance are improving day by day. The latest attempt has been aimed at constructing mathematical model of skill in a form which is suitable for computer analysis so that it could be simulated under several carefully controlled conditions for predicting more effective techniques for higher performance.\textsuperscript{38}

It is evident from the research finding as well as experts opinion that basketball players are very fast, quick, mobile, agile and active having enough endurance as well as balanced state of personality. Sports scientists in country are doing experiments to find different ways and to formulate the easiest and right methods of training to train their sportspersons for maximum output. Recent striking advancement in basketball game has been possible due to the over emphasis given by sports scientists and exports on systematic and scientific training as well as application of scientific knowledge and technology.

Lewis\textsuperscript{39} studied the somatotypes of A Grade provincial representatives and national representative basketball players in New Zealand and found that the heights and weights of players at different levels of selection did not differ, not did the somatotype rating, except for a decrease in endomorphy by half a unit at the higher levels of selection. Hirata\textsuperscript{40} studied 186 Tokyo Olympic Basketball players who averaged 189.4 Cm in height and 84.3 kg in weight. Except the shot putters, they were found to be the tallest in his sample of different games the tallest of the players being 218 cm. Hirata stated that it was an obviously favourable condition for shooters to be tall and the lean type was particularly suitable for prompt action. So they had the most suitable physique.

Carter\textsuperscript{41} reported a sample of ten USSR female basketball players somatotyped by Heath. They were found to be fairly tall (173.0 cm) and heavy (71.2 kg) for women, with a mean somatotype of 4.3 - 4.5 - 3.0. The close balance between endomorphy and

\textsuperscript{40} Ibid.
\textsuperscript{41} Ibid.
mesomorphy and the lack of physiques dominant in ectomorphy characterised this sample.

Sodhi[42] studied the top ranking Indian national basketballers and found that with the increasing standard of the participants the average stature was greater. The top class teams in the world have a greater average height than the teams of lower standard. A significant correlation was found between the stature and performance in the competition. The value of correlation was very high with the field basket scores. Thus, the greater the stature of a basketballer, the better will be the performance.

Sports skill tests are considered to be an important part of the modern evaluation process in programmes of physical education. The general purposes of skill tests are classification, diagnosis, grading, supervision, research etc. but the coaches fruitfully utilises the test scores in searching the potential team members from a large group of candidates. According to experts skill tests are in reality predictive measures since they attempt to discriminate among levels of playing ability. The experts in the physical education and coaching professions face the greatest problem in evaluating sports skill tests results and their relationship to level of playing ability Hopkins[43] concluded that test items would provide an objective measure of basketball skill and discriminate effectively between successful and unsuccessful participants.

During the last decade in many advanced countries the "muscle biophsy" technique has been widely applied to identify

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[42] Ibid.
the probable competition winner right at their young age. Recently "Histological" and "Histochemical" techniques have also been applied to identify different fibre types in the skeletal muscle of athletes. This is then used to correlate the contractile characteristics to their function and metabolic potentialities in various athletic events by determining different enzyme activities. It has become popular to determine muscle fibre composition of athletes involved in different types of events\(^{44}\). The assessment and prediction of body composition has gained widespread application in various disciplines of exercise science. They are application to physiology of exercise, biomechanics, exercise biochemistry, anatomy, motor integration and other allied medical fields that consider such topics as nutritional and dietary assessment, the man-machine interface, as well as various environmental concerns. Whatever application, one major area of interest is the predictive accuracy of body composition assessment, particularly percentage body fat and lean body weight\(^{45}\).

As different activities exerts different demands upon the organism with respect to circulatory respiratory, metabolic, neurological and temperative regulating functions, the study of various physiological variables is gaining more and more importance in relation to enhancement of human health and performance. Therefore, physiological variables like vital capacity, heart rate, blood pressure, anaerobic power per kg body


weight and body mass are specially considered as prerequisite for outstanding performance in speed and power sports activity.

The scientific study of the effect of exercise on the organism is becoming increasingly important with the growing realisation of the relationship of exercise with health. Field and laboratory observation on the exercising human subjects are being supplemented with physiological and biochemical studies on laboratory animals, with the result that many of the phenomena related with acute and chronic exercise can now be explained at basic cellular molecular levels\textsuperscript{46}.

Identification and selection of potential athletes in specific sports discipline based on scientific knowledge is a routine affair made by the developed countries. Unfortunately in India such investigating efforts has not yet received serious consideration as a result of which athletes are selected from the "Available pool" mainly on the basis of their performance records in various competitions. The athletes so selected are left with very little scope for further improvement through a planned schedule as most of such talents have by this time reached their peak performance. This is why a fresh effort based on scientific knowledge and observation should be explored to improve the methods of selection of the Indian athletes followed by scientific training and coaching with a view to raising the standard of performance to international level. Unfortunately again in India this new approach has not yet been effectively tried in the game of Basketball due to nonavailability of data. This situation has

prompted, inspired and motivated the scholar to take-up the present study.

1.2 Statement of the problem

The purpose of the study was to investigate selected physical, physiological, anthropometric and psychological variables as the predictive factors in basketball performance.

1.3 Delimitation

1. The study was delimited to the university level male basketball players.

2. The study was further delimited to the selected physical, physiological, anthropometric and psychological variables.

The variables undertaken in this study are as follows:

**Physical Variables**

i) Speed

ii) Flexibility

iii) Agility

iv) Explosive leg strength

v) Cardiorespiratory endurance

**Physiological Variables**

i) Haemoglobin content

ii) Resting heart rate

iii) Vital capacity

iv) Blood pressure
**Anthropometric Variables**

i) Arm length  

ii) Ponderal index  

iii) Crural Index  

iv) Arm ratio  

**Psychological variables**

i) Sports Competition Anxiety  

ii) Achievement Motivation  

iii) Sports Self-confidence  

iv) Composition of 16 P.F.

1.4 **Limitation**

1. Certain factors like food habit, daily routine and life style which might have some effect on the results of the study could not be controlled.

2. Nonavailability of some sophisticated instruments for measuring different variables was considered as another limitation of the study.

3. While conducting the tests no motivational techniques was used and as such the differences which might have occurred in the performance by the subjects was recorded as the limitation of they study.
1.5 Hypothesis

On the basis of the review of literature, discussion with the experts and also the scholar's own perception of the problem, it was hypothesised that the selected physical, physiological, anthropometric and psychological variables of this study would not have significant relationship with basketball playing ability.

1.6 Significance of the study

The sports scientists over the globe have been making this endeavour to assist the athletes to raise their sports performance always to a new height as a result of which athletes in each Olympic and world competition, national and international competitions are recording record breaking performances in different sports disciplines. Researchers and experts are also continuously striving to find out the best, easiest and at the same time most effective and economic methods of selecting and training the promising athletes in different sports disciplines in order to get the best results from them.

Several factors such as physical, physiological, psychological, anthropometric and skills - contribute both in selecting and gearing the athletes to achieve the record breaking performance. But very little research has been carried out to assess the relative importance of these factors in the success of outstanding performance. Basketball is not an exception. Performance standard in basketball in the international area has reached such a level that Indian cadgers have to go a long way to catch it. It is a quest for the improvement of selection procedure as well as training methods based on the knowledge of physical, physiological, psychological and anthropometric characteristics
that has prompted and encouraged the scholar to undertake the present study.

The present study may contribute towards promotion of basketball in the following manner.

1. Criteria for selecting the promising basketball players may be developed on the basis of the findings of the study.

2. The basketball players may be benefited from the results of the study by knowing the contribution of some selected physical, physiological, anthropometric and psychological variables towards successful performance in basketball.

3. The results of the study may be utilised as a screening tool for assessing and classifying the basketball players according to their quality.

4. The results of the study may provide the Physical education teacher and the coaches with the knowledge and information of the specific qualities which are to be possessed and developed by the basketball players for achieving success.

5. This study may help the physical education teacher and the coach in planning effective and sound training schedule for the basketball players.

6. This study may encourage some other scholars having interest in basketball to undertake research works of similar nature which will help in the improvement of the standard of basketball in the country.
1.7 Definition and Explanation of Terms

Physical variables

Speed:

Speed is defined as the rapidity with which a movement or successive movements of the same kind may be performed\(^{47}\). Speed is fitness with which one is able to move his body from one point to another\(^{48}\).

Flexibility:

Flexibility is defined as the range of possible movement about a joint or a sequence of joints. Flexibility refers to the ability of an individual to move the body and its parts through as wide a range of motion as possible, without under strain to the articulations and muscle attachments. Mc. Cue defines flexibility as the amount of movement which can be achieved in a joint or articulation\(^{49}\). Flexibility refers to the ability of an individual to movement which can be achieved in a joint or articulation\(^{50}\).

Agility:

Agility is the physical ability which enables an individual to rapidly change body position and direction precise in manner\(^{51}\).

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\(^{49}\) Clarke, Application of *Measurements to Health and Physical Education*, p. 12.


Agility is the ability to change both rapidly and accurately the position or direction of the body through large range of movement\textsuperscript{52}.

**Explosive Leg Strength**

Explosive leg strength can be defined as the ability of the leg extensors to apply maximum force in the shortest time.

**Cardiorespiratory Endurance**

Cardiorespiratory endurance is the ability to continue or persist in strenuous tasks involving large muscle groups for long periods of time\textsuperscript{53}.

**Physiological Variables**

**Haemoglobin Content:**

Haemoglobin is a red coloured protein located in erythrocytes which transport most of the oxygen in the blood. Anologenesic protein composed of four polypeptide chains each at which contains a hemogroup having a single atom of iron with which oxygen reversible combines\textsuperscript{54}.


Resting Heart Rate:

Best and Taylor\(^{55}\) have stated that the resting heart rate is pressure change transmitted as a wave through the arterial wall and blood column to the periphery while the person is at rest.

Vital Capacity:

Vital capacity is the maximal volume of air that can be forcefully exhaled from the lungs following a maximal inspiration\(^{56}\).

According to Clarke\(^{57}\) vital capacity is defined as the largest volume of air that can be exhaled after deepest possible inhalation.

The maximum volume of gas that can be expelled from the lungs following a maximal inspiration is called vital capacity\(^{58}\).

Cureton\(^{59}\) defines vital capacity as the maximum volume of air that can be expired after taking full inspiration. Maximal volume of air forcefully expired after maximal inspiration\(^{60}\).

\(^{55}\) Ibid p. 156.


Blood Pressure:

Blood pressure has been defined as the force or pressure which the blood exerts on the walls of the blood vessels in which it is obtained. When the left ventricle contracts and pushes the blood in the aorta, the pressure produced is known as systolic blood pressure. When complete cardiac diastole occurs and the heart is resting with no ejection of blood, the pressure within the blood vessels is termed as the diastolic blood pressure. According to Chatterjee, blood pressure is the lateral pressure exerted by the blood on the vessel walls while flowing through it.

Resting blood pressure would indicate the pressure during basal condition.

Blood Pressure is the pressure exerted on the wall of the arteries as the heart pumps blood through the body. Systolic pressure is obtained when blood is ejected into the arteries. Diastolic pressure is obtained when the blood drains from the arteries.

Psychological Variables

Sports Self Confidence:

Self confidence is an accumulation of the athlete's unique experiences in achieving many different things which result in

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the specific expectations he or she has about achieving success in a future activity\textsuperscript{64}.

**Achievement Motivation:**

An effective arousal state directing behaviour in an achievement oriented activity cognitively apprised as potentially satisfying. It is assessed here as in the motivational disposition the need to do a job well and the need to be a success which results in emulation of the successful rather than in hard work\textsuperscript{65}.

**Anxiety:**

Anxiety may be defined as a state of emotional and physical disturbance induced in a person by real and imagined tract. In psychiatry the term refers to disturbances caused by threats that are only apparent to the individual and cause him to behave in a way that is not relevant to the true situations\textsuperscript{66}.

Anxiety is an uneasiness and feeling of foreboding often when person is about to embark on a hazardous venture. It is often accompanied by a strong desire to excel\textsuperscript{67}.

For the purpose of the present study, competition anxiety will be measured by Sports Competition Anxiety Test (SCAT) developed by Martens (1977). It is an A-trait scale designed for


\textsuperscript{65} Elsie Carter Buston, "State and Trait Anxiety, Achievement Motivation and Skill in College Women" *Research Quarterly* (1971) : 140.

\textsuperscript{66} *Encyclopedia American* 1966 ed. S. V. "Anxiety".

\textsuperscript{67} Agyajit Singh, "Competitive Anxiety in sports" *SNIPES Journal* 5 (July 1988) : 41.
measuring a predisposition to respond with ranging levels of A-state in competitive sports situations. SCAT was constructed to assess trait anxiety in a competitive situation. 68

State anxiety:

A transitory emotional state or conditions of the human organism that is characterised by subjective consciously perceived feeling of tension and apprehension, and heightened autonomic nervous system activity. 69

Trait anxiety:

Trait anxiety is defined as the relatively stable individual differences in anxiety proneness, that is characterised as a tendency to respond to situations perceived as threatening with elevations in a state intensity. It is a relatively stable personality trait. 70

Personality:

Gordon Allport 71 in 1937, reviewed some fifty definitions of personality and attempted to combine the best features of each by defining personality as "the dynamic organisation within the

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individual of those Psychophysical Systems that determine his unique adjustments to his environment”.

Hans Eysenck\textsuperscript{72} defined personality as “the more or less stable and enduring organisation of a person’s character, temperament, intellect and Physique, which determines his unique adjustment to the environment.

One of the most recent and comprehensive definitions of Personality has been given by Salvatorra Madde\textsuperscript{73}. Personality is a stable set of characteristics and tendencies that determine those commonalities and differences in the Psychological behaviour (thoughts, feelings and actions) of people that have continuity in time and that may or may not be easily understood in terms of the social and biological pressures of the immediate situation alone.

For the purpose of the present study the Catell 16 PF Questionnaire will be used to measure athlete’s personality.

Level of aspiration:

Generally speaking, a person’s level of aspiration concerns his personal expectations, his goals, and the self-demands which he associates with his performance on a particular task. Frank\textsuperscript{74} provides the most accepted - definition of level of aspiration as “the level of future performance in a familiar task which an individual, knowing his level of past performance in that task explicitly undertakes to reach.”

\textsuperscript{72} Ibid., p. 111.
\textsuperscript{73} Ibid., p. 112.
\textsuperscript{74} Ibid., p. 216-17.
Anthropometric Variables:

Anthropometric variables are dimensions of the structure of the human body taken at specific sites to give measures of length, girth and width.\textsuperscript{75}