CHAPTER-I

INTRODUCTION

1.1 PROLOGUE

Sport serves vital and important role in social and cultural functioning for each individual. In the last few decades, sports have gained tremendous popularity all over the globe. Now a day, there has been an ever increasing focus on attention on the study of individual differences in research. In this regard a large number of researchers are engaged in comparing the motor performance of different sections of population in terms of race or otherwise various regional backgrounds. The net results of their finding have been contradictory and there is no unanimity among the research scholars regarding inter-relationship between or the degree of influence.

The players are creating and breaking new records in today’s competitive sports. The aim of games and sports is fast suited with every field. The level of physical fitness is increasing day to day because of development of science and technology. Volleyball is a game played indoor or outdoor by teams whose members seek to score points in the course of hitting a ball back and forth across a net. It is a popular game in the matter of techniques, blocking as well as jumps and smashes play a crucial part in volleyball.

Successful play in volleyball is not the outcome of power alone, but it is the product of combined display of power, shrewdness and ability. Modern game is characterized by accuracy and differentiation, which can be facilitated by absolute self control and maximum concentration. Played competitively, the game requires concentration, quick thinking and a great deal of movement. The speed of the game means the player must be thinking at one moment about the attack and next about defence. Tactical formations, moves, substitutions, use of
time outs and team line up all have so many variations and have an effect on the quality and results of the game.

One of the present trends in the game of volleyball is the emphasis on ‘block’ and in relation to that selecting the players of about two meters average height, which further necessitates the spikers to have similar physical characteristics as well as tremendous amount of jumping ability to outclass the blockers in the actual game.  

1.1.1 Physical Fitness of Volleyball Players

Physical fitness comprises two related concepts: general fitness (a state of health and well-being) and specific fitness (a task-oriented definition based on the ability to perform specific aspects of sports or occupations). Physical fitness is generally achieved through exercise, correct nutrition and enough rest. It is an important part of life. In previous years, fitness was commonly defined as the capacity to carry out the day’s activities without undue fatigue. However, as automation increased leisure time, changes in lifestyles following the industrial revolution rendered this definition insufficient.

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 (Nixon et al., 1969).  

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1 Marianne Fiedler et al., ‘Volleyball’ (GDR German College for Physical Culture, 1979), p.39.
Successful game of volleyball needs ability of the players to produce good speed, agility, flexibility and unbelievable power during the play of game. Skills like serving, passing, attack and block are of utmost importance for a player at any level of play. Not merely skills but also physical and anthropometric measurements of a player will contribute to the success of the player as well as the team. The performance of athletes, players, sportsmen at various National and International competitions has been poor and this is of great concern especially to the coaches, physical educationists, sports scientists and researchers. Optimal performance thus requires a combination of technical and tactical abilities as well as a high degree of physical fitness. Efforts, to improve the standard of our sportsmen have achieved an insignificant success in this respect. The performance of any player will depend upon his physical fitness and anthropometric characteristics.

Physical activity enhances mental development of person (Cowell and France, 1963).\(^3\) In physical education and sports, especially, in developing physical fitness there is a large collection of activities for experiencing success (Kane, 1975).\(^4\) Many studies conducted outside India have advised for physical fitness has positive effect on sport performance capacity (Harre, 1977 and Hollman, 1981).\(^5\)

Physical fitness is, in a very broad sense, determined by the individual’s capacity for optional work and motor and sport performance (Astrand & Rodahl, 1986).\(^6\) General fitness implies the ability of a person to live most effectively

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with his/her potential, which depend upon the physical, mental, emotional, social and spiritual component of fitness which are highly interrelated.

The primary components of physical fitness identified by the Volleyball players require well-developed abdominal strength, muscular power, flexibility, agility, speed, muscular endurance and coordination and swift movements (She, 1999). The power, speed, and agility are important indicators of volleyball performance (Vescovi & Mcguigan, 2008).

Volleyball requires athletes to be explosive in the lower limbs; this is especially emphasized in the front row hitting positions when attacking on offense or blocking on defense. Vertical jump emphasizes lower body power, and it is known that Power=(Force x Distance)/Time. Vertical jump is an anaerobic explosive movement that requires recruitment of the highest threshold motor units (Amasay, 2008).

The body needs to apply large amounts of muscular force over the largest amount of distance in the smallest amount of time in order to produce the highest vertical jump. Jumping height is decisive for the execution of techniques and tactics in volleyball (Jin et al., 2007). Volleyball requires the athlete to jump as high as possible while attacking the ball with upper body movements. Vertical jump is important in volleyball because of the need to hit the ball around the opponent on the opposite side of the net. The higher a players’ vertical jump height, the less likely it is that the ball will be blocked by the opponent on defense.

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Vertical jump is a major determinant of volleyball performance and many researchers have studied different aspects of vertical jumping. According to Gutierrez and Marcos (2009), the factors that affect vertical jump are height reached by the center of gravity, time required for execution, and the spatial orientation of the corporal segments. It was found that the jumping ability had a positive correlation with the number of spiking, and the total success rates of spiking, blocking and serving in a game (Tian, 2006).

Among all the physical performance indicators, speed is also one of the most important factors. Speed is the trend of development in modern volleyball sport. Speed requires the athletes to be able to move quickly to the optimal position on the court. Speed and agility in tactics, as the key factors, work together to make suddenness the feature of modern volleyball sport (Huang, 1992).

Nicholls recommends power, agility, coordination, flexibility, muscular and cardio respiratory endurance and concentration as well as quick thinking and reaction time as the factors basic to performance in volleyball.

Sotire puts emphasis on the development of certain qualities like strength speed, control, the ability to relax, technical skill and coordination and the psychological and mental qualities of determination, will power, courage aggressiveness, selflessness, concentration, team spirit and sportsmanship as the essentials of performance in volleyball.

One of the most important factors influencing movement is agility, involved in coordinating quickly and accurately the big muscles of the body in a

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particular activity. One’s level of agility is probably a result of both innate capacity and training and experience. Agility plays a vital role in all games and sports specially in the field of volleyball because when a player participate in game then he has to bring about a purpose of quick change in direction and movement of various parts of the body.

1.1.2 Physiological Variables of Volleyball Players

Several studies have examined the relationships between physical fitness and anthropometric measurements of volleyball players (Gladden & Colacino, 1978; Fry et al., 1991). The findings of these studies have shown that certain anthropometric measurements are advantageous to the volleyball players, including greater height and greater vertical jump distance (Gladden & Colacino, 1978).

Physiology is the study of functions of the human body. Human physiology is the bird in the house of the mechanical, physical and biochemical functions of humans in good health, their organs and the cells of which they are composed. Most aspects of human physiology and animal’s experimentation have provided much of the foundation of physiological knowledge.

The physiological variable are play an important role for the attainment of high level sports performance. Physiological variables may be defined as those variables which are directly linked with various physiological systems such as heart rate, blood pressure, vital capacity and respiratory rate. Physiological variables such as cardiovascular efficiency, percentage of fat, vital capacity and other should be taken into consideration while selecting volleyball players.

Arterial blood pressure is the force of pressure, which the blood is exerting against the walls of the blood vessels in which it is contained. This

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pressure varies during the carding cycle. During ventricular systole, when the left ventricle is forcing blood into the aorta the pressure rises to a peak, systolic pressure. During diastole the pressure falls, the lowest value it reaches being called diastolic pressure. Systolic blood pressure is produced by the hearty muscle, which drives the contents of the ventricle into the already stretched arteries. During diastole the arteries are kept partly swollen because the peripheral resistance of the arterioles prevents all the blood running off into the tissues. Thus the blood pressure depends partly on the force and volume of the blood pumped by the heart and partly of the contraction of the muscles in the walls of the arteries.

Heart rate is number of systolic and diastolic phases of heart per minute or the number of ventricular beats per minutes is heart rate. Heart rate is usually determined from pulse rate, which is number of pressure waves per minute along the carotid artery at the neck or the radial artery at the wrist. In normal individuals, Heart Rate equals pulse rate. The time period from one heart beat to the next is the internal between cardiac cycles; control of Heart Rate at rest and during work is maintained by the blood entering the heart and by the automatic nervous system.

Cardio-respiratory endurance denoted capacity of individual to work effectively with the help of oxygen which is collected, transported and utilized by lungs, blood and muscles respectively. Any work as daily task or form of physical activity is directly related to energy supplying system which in turn is the cardio-respiratory endurance. Cardio-respiratory endurance varies from individual to individual and one of the important variables for establishing top class performance in volleyball as the game involves work of long duration/endurance type.
The lung function tests, like other physiological tests must be of the utmost importance for measuring the fitness of an athlete. There is also a need to develop respiratory capacities, which pertains to the ability of the body to supply the oxygen. Respiratory parameters vary from individual to individual and is one of the important variables for establishing top class performance in volleyball as the game involves work of long duration.

Lung capacity is defined as the largest volume of air that can be exhaled followed by deepest possible inhalation. Pulse rate as a wave of distension and elongation that is felt in an artery wall due to the contraction of the left ventricle forcing blood into the already full aorta. The basis of peak respiratory flow for monitoring the ventilatory function were the amount of air and maximum rate of flow during an expiration followed by a deepest possible inspiration. This can be measured with a peak flow meter. Lung capacity may be defined that as it’s the largest volume of air that human can exert after the maximum inhalation.

Many studies have examined the relationship between physical and physiological characteristics and overall game performance in volleyball players. These studies have shown certain characteristics to be advantageous to players, including greater height, greater vertical jump distance, greater mass, greater upper body strength and lower body fat percentage. However, each study compared the variables to some measure of overall playing ability and not to the skill performance. An athlete can have a high overall game performance but be weak in one specific skill. Identifying those factors that are characteristic to high performance in a certain skill may provide a focus for improvement in that skill. Once weaknesses are revealed, the athlete may then concentrate on improving the factors that lead to high performance in that skill.
Several studies have documented the physiological and anthropometric characteristics of volleyball players (Hakkinen, 1993), with the fitness of players typically increasing as the playing standard is raised (Gabbett & Georgieff, 2007). Smith et al. (1992) compared physical, physiological, and performance characteristics of national and college standard volleyball players and found significantly higher block and spike jumps, 20-m speed, and VO2 max in the national standard players, suggesting that physiological capacities play an important role in the preparation and selection of volleyball players.

Physiologically, volleyball is an intermittent sport that requires players to participate in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Kunstlinger et al., 1987; Viitasalo et al., 1987). Considerable demands are also placed on the neuromuscular system during the various sprints, jumps (blocking and spiking), and high-intensity court movement that occurs repeatedly during competition (Hosler et al., 1978).

Several studies have documented the physiological and anthropometric characteristics of volleyball players (Fleck et al., 1985; Spence et al., 1980), with the fitness of players typically increasing as the playing standard is raised. Despite concern about the fact that the selected components of physical fitness, anthropometric measurements and physiological variables are an essential key

for successful participation in sport competition but very little has been explored in relation to different level of competition.

1.1.3 Mental Toughness of Volleyball Players

Sports psychology, the youngest of the sport science, is concerned with the psychological effect derived from participation. Today many outlets and Coaches look to sport psychology for a competitive edge by seeking psychological training Programme in order to learn among other thing, way to manage, competitive stress, central concentration, improve confidence and increase communication skill and team harmony. Competitive sports provides psychologist with many fascinating opportunities to explore the success with which people can control their own mental processes in the face of adversity. If paying attention is viewed as an effort to exert control over what we perceive and do, then the study of concentration in athletes offers a potentially fruitful new avenue for the study of how the mind works.

In this modern era of competition the psychological preparation of team is as much important as teaching the different skills of a game on the scientific lines. The team is prepared not only to play the games also to win the games, it is not the proficiency in the skills which gives victory but more important is the spirit of the players, with which they play and perform their best in the competition.

“Mental Toughness” surface to an individuals and inner derive to succeed particularly when the going is challenging. It explains when it is possible to place two individuals in to the same working environment and see that one find it difficult to cope with pressure and one thrives

Mental toughness is one of the most important psychological characteristics related to outcomes and success in any sport; so that most coaches
and sport psychologists; beliefs mental toughness is the most important psychological factor affecting the success of any sports person/athletes.

The mental toughness as one of the most important psychological characteristic related to outcomes and success in any sport, although researchers have, until recently, devoted little time to studying this concept.

“Mental toughness is having the natural or developed psychological edge, which enables to generally cope better than opponents with the many demands (competition, training, and lifestyle) that sport places on a performer, and specifically, be more consistent and better than opponents in remaining determined, focused, confident, and in control under pressure” (Jones et al., 2002).

Many coaches are becoming aware of the importance of developing mentally tough performers and are designing programs to develop mental toughness in their athletes. Though the concept of mental toughness continues to attract the interest of researchers throughout the field of sport psychology, it remains largely unexplored in many respects.

Mental toughness is about how effectively individuals respond to stress, pressure and challenge. Understanding this concept is essential to improving performance for both the individual and organization, and this ground-breaking book explains mental toughness clearly and effectively. The mental toughness is an important psychological characteristic for sport performance.

Mental toughness also illustrates a strong link between stress management & peak performance development where the later can’t be achieved without performer. The assumption has been accepted that mentally tough

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sportsperson typically perform better, but no investigations have specifically examined this relationship.

1.1.4 Anthropometrical Measures of Volleyball Players

Anthropometric characteristics play an important role in determining the success of an athlete. Quite naturally, the interest in anthropometric characteristics and body composition of sportspersons from different competitive sports has increased tremendously over the last decades. It has been well established that specific physical fitness or anthropometric measurements indicate whether the player would be suitable for the competition at the highest level in a specific sport (Slater et al., 2005).

Anthropometry is the measurement of body size and proportions. The measurements include body weight, height, circumference, skin fold thickness, and bony widths and lengths (Heyward, 2006). Anthropometry is a branch of science concerned with comparative measurements of the human body, its parts, and its proportions and composition. It is the study of measurement of the human body in terms of the dimensions of bone, muscle and adipose tissue.

Anthropometry has been used to assess gross structure and function. There are numerous factors which are responsible for the performance of a sportsman. The physique and body composition, including the size, shape and form are known to play a significant role in this regard. At present, sportsman for superior performance in any sports is selected on the basis of physical structure and body size.

An athlete’s anthropometric and physical characteristics may represent important prerequisites for successful participation in any given sport (Gualdi-

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Russo & Zaccagni, 2001)\(^{26}\) 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; Reilly et al., 2000; Gabbett, 2000; Slater et al., 2005).\(^{27}\)

Therefore, it is of practical relevance and importance to identify those skeletal characteristics that will favour a specific sport. The changeable (body composition) and unchangeable (skeletal size, shape and proportion) anthropometric characteristics predisposing to success will differ from sport to sport. Bale (1986)\(^{28}\) suggested that size, shape and body composition play an important part in providing distinct advantage for specific playing positions, especially at elite level of competition where there is a high degree of player specialization. This suggests that the anthropometric characteristics for success may not only differ from sport to sport, but also within different playing positions in team sports. The knowledge of anthropometric characteristics also allows the athlete and the coach to make adaptations to his/her training regime to attain the optimal physical attributes for best performance.

In fact, the information regarding the anthropometric status of an athlete is essential for two main reasons, firstly, to design an effective training program and secondly to select the event-specific talents in the players. Some anthropometric characteristics, e.g. length and breadth measurements, are genetically determined and can hardly be changed with the effects of a training program. Various anthropometric measurements were found to be closely associated with excellent performance in volleyball.

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Body composition plays an important role in achieving excellence in sports performance (Mathur & Salokun, 1985). Body composition refers to the characterization of body weight in terms of absolute and relative amounts of fat mass and fat-free mass. It is the relative percentage of muscles, fat, bone, and other tissues of the body. Excess body fat is detrimental to performance in most sports whereas, fat free mass, especially muscle mass, is generally associated with performance. Body composition also makes an important contribution to an individual’s level of physical fitness for performance, particularly in such sports that require one to carry one’s body weight over a distance, which is facilitated by a large proportion of active tissue (muscle) in relation to a small proportion of fat tissue (Jain, 2004).

Therefore, the determination of body composition is significant in terms of a training plan as well as success in the game. Optimal physique is apparently an advantage to volleyball performance. Only when a volleyball team is collectively equipped with the entire ideal anthropometric characteristics can the team succeed in a game. The height over the net is a decisive factor for volleyball games, determined by the athletes’ stature and jumping height, and shown in blocking height and spiking height.

Grgantov et al. (2006) indicated that a greater body height would allow the ball contact occurring at a greater height above the net. All these bring forward the demand for specific physique of volleyball athletes. In modern volleyball game, focus is to win the dominance over the net, and the best way to win this dominance is to recruit athletes who are taller with greater jumping ability. Arm span and standing reach height have also been suggested as

essential factors for higher spiking and blocking. Arm span is closely related to most of the volleyball techniques, especially in attacking. To make full use of the spiking speed of a waving arm, a long arm is an advantage. Jin and colleagues suggested that standing reach height should be used as an essential criterion in recruitment of volleyball players.

You and Huang suggested that arm length had a significant correlation with the performance over the volleyball net, especially in attacking. Longer arm is important too in defense. The length of the arm span of elite volleyball players has been found to be approximately 5 cm longer than his/her height. The arm span and the standing reach height are found to be closely related.

Therefore, this study sought to examine the relationship between physical, physiological, psychological (mental toughness) and anthropometrical variables with game performance of college level volleyball players.

1.2 IMPORTANCE OF THE STUDY

For volleyball players, there are several key components that play feature in physical performance. Since volleyball is a dynamic sport, measures of power, agility, coordination, muscular endurance and cardio-respiratory endurance could all play a factor in performance. Mental toughness is a common term used in sport atmospheres, and it is usually linked with some evaluation of performance. This study will provide support for the assumptions of coaches, athletes, and other sport professionals that mental toughness is important for successful performance in sport. Because this research examines the relationship between successful game performances with physical, physiological, psychological (mental toughness) and anthropometric variables of volleyball players, the results will attempt to shows that players who have physical, physiological, psychological and anthropometric measurements will also achieve consistently better on the skill/game performance in the court.
1.3 STATEMENT OF THE PROBLEM

The Statement of the Problem selected for the present study is as follows:

“Relationship of Selected Physical, Physiological, Psychological and Anthropometrical Variables with the Game Performance of College Men Volleyball Players.”

1.4 DELIMITATIONS

The study was delimited in the following ways:

1. The study was delimited to the engineering college men volleyball players of Bangalore jurisdiction, under Visvesvaraya Technological University (VTU),

2. The study was delimited to one hundred and thirty college level volleyball players.

3. The study was delimited volleyball players age ranged between 18 years to 25 years.

4. The study was further delimited to the following parameters :

   I. Game Performance (Overall skills of serve, pass, attack & block)

   II. Physical Variables
       1. Abdominal Strength
       2. Muscular Power
       3. Flexibility
       4. Agility
       5. Speed
       6. Muscular Endurance
       7. Coordination

   III. Physiological Variables
       1. Blood Pressure: Systolic and Diastolic.
       2. Cardiovascular Endurance
       3. Lung Capacity.
IV. Psychological Variables

Mental Toughness Questionnaire Consists of the following items:

a) Reboundability
b) Ability to Handle pressure/Stress Management
c) Winning Concentration Ability
d) Self confidence
e) Motivation/Goal setting

V. Anthropometric variables

a) Standing Height
b) Body Weight
c) Arm Length
d) Arm Span
e) Leg Length

Circumference or Girth

a) Arm Girth
b) Thigh Girth
c) Calf Girth

Muscle bone and fat (Skinfold measurements)

a) Biceps
b) Triceps
c) Subscapular
d) Suprailiac

1.5 LIMITATIONS

This study is limited in the following aspects and has to be taken into considerations.

1. The subjects are from different socio-economical conditions. Their ways of living, food habits, and daily routine have not been considered limitation of the study.
2. The study is limited to the data procured from the relevant tests conducted during the intercollegiate competition.

3. The study is limited to the data related to game performance on coaches rated scale.

4. The study is also limited to the responses given by the samples pertaining to the Mental Toughness Questionnaire administered during the intercollegiate competition.

1.6 HYPOTHESES

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

1. It was hypothesized that there may not be any significant relationship in selected physical, physiological, psychological and anthropometrical variables with the game performance of volleyball players.

2. It was hypothesized that there may not be any significant differences in the physical variables among volleyball players with different play positions.

3. It was also hypothesized that there may not be any significant differences in the selected physiological variables among volleyball players with different play positions.

4. It was hypothesized that there may not be any significant differences in the mental toughness among volleyball players with the different play positions.

5. It was hypothesized that there may not be any significant differences in the anthropometric variables among volleyball players with different play positions.

6. It was also hypothesized that selected physical, physiological, psychological and anthropometrical variables could not turn out to be significant predictor of game performance of the volleyball players.
1.7 SIGNIFICANCE OF THE STUDY

1. The Results of the study will be of great interest to physical educators, coaches and to the players, as they would be able to assess the physical, physiological, psychological and anthropometrical variables for efficient game performance of volleyball.

2. The findings of the study will be of great value in designing and administering fitness programs for those who need such attention.

3. The result of the study will also help to assess the comparative standards of different sports persons.

4. The results may also help the physical educators to set the norms for the selection of volleyball players.

1.8 DEFINITION AND EXPLANATION OF THE TERMS

Relationship: Relationship is estimating one variable score to another variable based on the persons score on one or more of other measures. (Baumgartner, T. A and Jackson, A.S. 1987).

Physical Fitness: "The ability of a muscle to repeat identical movements or pressures, or to maintain a certain degree of tension over a period of time" Johnson and Nelson.32

Physiological Variable: Physiological Parameters are used here to refer to measurements of human physiological functions such as those provided by heart exchange data or human response to such environmental factors as contaminants.33

Psychological Variable: Psychology is an academic and applied discipline that involves the scientific study of mental functions and behaviors.34 A variable is

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34 "Definition of "Psychology (APA's Index Page)"", Retrieved 20 December 2011.
something that can be changed, such as a characteristic or value. Variables are generally used in psychology experiments to determine if changes to one thing result in changes to another.

**Reboundability:** Bouncing back from set backs and mistakes.\(^{35}\)

**Pressure:** The exertion of maximum competitive efforts on the opponent, such as the pressure of a hard running attack in football.\(^{36}\)

**Self Confidence:** A person with who you can share your feelings and secrets.\(^{37}\)

**Concentration:** To give attention to your mental power or your efforts towards particular activity.\(^{38}\)

**Motivation:** Motives are theoretical concepts used to explain the direction, intensity and persistence of behavioral patterns.\(^{39}\)

**Anthropometry:** “Anthropometry means the measurement of man, whether living or dead and consists primarily in the measurement of the dimension of the body” Montagu.\(^{40}\)

**Body Composition:** Body composition refers mainly to the evaluation of three principle tissue components of body i.e., muscle, bone and fat.

**Game Performance:** The coach’s objective rating of a player’s level of development in performance skills required for all areas of forward match play. The performance criteria consist of a number of serve, pass, attack and block.

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\(^{38}\) Ibid., P.28.


\(^{40}\) Montagu, M.F. Ashley, "An Introduction to Physical Anthropology", (Springfield, 1960).