

## **CHAPTER - I**

### **INTRODUCTION**

Sport has very prominent role in modern society. The world sport has a popular appeal among people of all ages and both sexes. Much of the attraction of sports comes from the wide variety of experience and feelings that result from participation joy, anguish, success, failure, exhaustion, pain, relief and a feeling of belonging sport can bring money, glory, status and good will, however, sport can also bring tragedy, grief and even death.

The study of Sport Science traditionally not only incorporates the areas of sport physiology, sport psychology, and sport biomechanics but also includes the other topics such as sport training and sport nutrition, sports technology, sport anthropometry, and performance analysis. Sport scientists and performance consultants are growing in demand and employment numbers, with the ever-increasing focus within the sporting world on achieving the best results possible. Through the study of science and sport, researchers have developed a greater understanding on how the human body reacts to exercise, training, different environments and many other stimuli.

#### **1.1 SPORTS TRAINING**

Training is the main component and the basic form of preparing the athlete for higher level of performance. It is asystematically

planned preparation with the help of the exercise which realizes the main factors of influencing athlete's progress. "Training is a systematic process of repetitive, progressive exercise or work involving learning process and acclimatization" (Daniel, 1985). "Sports training refer to the physical, technical, intellectual, psychological and moral preparation of an athlete by means of physical exercises" (Harre, 1982).

"Sports performance can be improved through Sports training. Like any other type of human performance, a sports performance is also a product of the total personality of the sports person. In general the personality of a person reflects the aspects like physical, physiological, social and psychic traits. Therefore, apart from physical and physiological traits, the social and psychic trait of the sports person needs to be improved for achieving improvement in sports performances" (Singh, 1991).

## **1.2 BADMINTON**

"The Game of Badminton is wonderful sport that requires eye-hand coordination, striking and quick movements and change of direction in pursuit of the shuttle cock. Badminton is a power game requiring quick and powerful movements to all directions to return the shuttle cock to the opponents' side of the court".

Badminton is an extremely demanding sport. At an elite level, players are often required top form at their limits of speed, agility, flexibility, endurance and strength. On top of all of this, players must

maintain a high state of concentration in order to meet the tactical as well as mental demands of dealing with their opponents. It is therefore essential that everyone involved with the modern game ought to be familiar with the fitness requirements of the game and must know how 'Badminton fitness' can be enhanced.

Badminton is a highly explosive sport, involving a unique movement technique over a relatively small court area (Hughes, 1995). It is an intermittent sport characterized by long bouts of high intensity exercise interspersed with rest periods (Faccini and DalMonte, 1996), and entails vigorous movement of both the lower and upper body musculature (Reilly *et al.*, 1990).

### **1.3 PHYSICAL AND PHYSIOLOGICAL REQUIREMENT OF THE SPORT**

Badminton is a highly complex sport and this presents great challenges for players and coaches of all levels. An individual rally is a series of demanding movements performed using a movement pattern which is unique compared with any other sport. Rally length is often short (average for elite players is around 6-8 seconds) and, consequently, performed at very high intensity. However, players must also be prepared for long rallies. Rallies are interspersed with short rest Periods (typical duration around 15 seconds) which allow partial recovery from the previous rally, however, competitive matches may last at least 45 minutes. So, badminton is a combination of speed (anaerobic fitness) in rallies and endurance (aerobic fitness) to allow

sustained efforts and to promote recovery between rallies. Great strength, power, agility and flexibility are also required. All of these fitness components should form part of a player's fitness training. Additionally, the development of tactical and technical elements is, of course, also vital.

Junior players are required to have a good stroke production and physical fitness, as well as Physiological characteristics that will enable successful performance at the competitive level. The sport-specific technical skills in racket sports are predominant factors. The physical fitness of a player however, can be a decisive determinant of success during a tournament (Smekal et al., 2001).

According to Groppe and Roetert (1992) and Lei et al. (1993), the physical requirements of racquet sports demand efficiency in a number of fitness components. To be able to execute advanced strokes or compete effectively against progressively stronger opponents, a player would need to develop higher levels of the basic physical qualities, such as strength, power, muscular endurance, flexibility, coordination and agility.

Many sports require a generation of high forces and power outputs (Reilly et al., 1990). It is the muscles' ability to develop tension that forms the basis for all types of movement in sport (Omosegaard, 1996). Badminton at the highest level places a great

demand on leg and back strength, leg endurance as well as explosive power (Omosegaard, 1996).

### **1.3.1 STRENGTH**

Muscular strength can be defined as the peak torque or force developed during a maximal voluntary contraction, under a given set of conditions (MacDougall et al., 1991). Badminton is a sport that is strength-related, rather than strength-limited in that the performance of a player is influenced by strength, not limited by it (Wrigley and Strauss, 2000).

### **1.3.2 LEG STRENGTH**

Badminton at the highest level puts a great demand on leg strength and endurance (Omosegaard, 1996). The muscle strength during a movement varies during the range of movement due to muscular and mechanical conditions. Normally, the more a muscle is stretched, the more tension it can produce.

### **1.3.3 ARM STRENGTH**

The important muscle groups of the arm for badminton are the rotator muscles of the shoulder joint, the under arm rotators, the arm extensors and the shoulder muscles which lead the upper arm forward-upwards, and backwards – upwards. The muscle strength of the arm is not an important requirement for badminton because the forces required in hitting the shuttle are not great (Reilly et al., 1990 and Omosegaard, 1996). This is due to the fact that the resistance to

the stroke of the movement is small (a racquet weighs approximately 100g and the shuttle is very light), and the smaller the resistance to movement, the less maximal muscle strength matters to the speed of the movement (Omosegaard, 1996). Speed strength, explosive strength and to some extent, maximum muscular strength are important for the arm muscles in badminton (Omosegaard, 1996).

#### **1.3.4 POWER**

Muscular power or explosive strength is one such element, and the ability to generate great amounts of power is recognized as a primary factor in athletic success (Beckenholdt and Mayhew, 1983). According to MacDougall et al. (1991), the relevance and relative importance of power in sport performance will vary according to the different requirements of the sport. Leg power is an important component in badminton in that it results in the player being able to move quickly and explosively to the shuttle in various directions and to jump high to play overhead strokes. Greater leg power results in a greater acceleration and faster speed when lifting off the floor when moving, or jumping to the shuttle. According to Omosegaard (1996), an explosive player will typically be able to jump high, change direction quickly and will generally appear to be swift and mobile on the badminton court.

#### **1.3.5 MUSCULAR ENDURANCE**

Muscular endurance is the ability of a muscle group to execute repeated contractions of submaximal resistance, over a period of

sufficient time to cause muscular fatigue, or to statically maintain a specific percentage of maximal voluntary contraction for a prolonged period of time (Luttgens et al., 1992 and ACSM, 1995). Endurance is involved to some extent in badminton due to the fact that ST fibres were found in the vastuslateralis muscles of badminton players. The repeated push-offs in the corners and playing center, places great demands on the dynamic endurance of the leg muscles of badminton players (Omosegaard, 1996).

### **1.3.6 SPEED**

Speed is needed in badminton in moving to and from the shuttle. Speed on a badminton court is not only a question of being in good physical condition or following the right tactics, but is a combination of technique, tactics, physique and mental frame of mind (Omosegaard, 1996).

Running speed and agility are very important to the badminton player due to the need for speed variation, height and angle of approach to the shuttle. The ability to cover short distances quickly will also be of great advantage to the badminton player (Todd and Mahoney, 1995). Due to the nature of the game and the size of the court, it is important for the badminton player to reach his/her maximum speed as fast as possible.

### **1.3.7 FLEXIBILITY**

Flexibility is an important, yet often neglected component of physical fitness (Heyward, 1998). Flexibility reflects the ability of the muscle-tendon units to elongate within the physical limitations imposed by the joint (MacDougall et al., 1991). A greater flexibility in badminton players would result in improved maximal strength, a greater ability to utilize the stretch-shorten cycles effectively, augmented efficiency and correct movement patterns throughout the required range of motion. It is for these reasons that flexibility is an important component of badminton.

### **1.3.8 AGILITY**

Agility is the physical ability that enables a rapid and precise change of body position and direction (Johnson and Nelson, 1986), without a loss of balance (Sharkey, 1986). The whole body movement can be performed in the horizontal plane, or in the vertical plane (Draper and Lancaster, 2000). Agility is important to the badminton player due to the variation in the speed, height and angle of approach to the shuttle (Todd and Mahoney, 1995).

### **1.3.9 CARDIORESPIRATORY ENDURANCE**

Cardiorespiratory endurance is described by ACSM (1995) as the ability to perform dynamic exercise involving large muscle groups at moderate to high intensity for prolonged periods of time. Simply stated, it is the ability of the body to take up, transport and utilize oxygen efficiently. A well conditioned heart and an efficient respiratory



system are essential for high levels of aerobic fitness, as it means that the systems will be able to adjust and recover quicker from the effects of exercise and work (Sharkey, 1997).

Elite badminton players require a combination of aerobic and anaerobic energy systems, and the involvement of these systems depend on the intensity of the rally and the duration of the match (Dewney & Brodie, 1980). Ninety percent of the energy demand is associated with the repeated bursts of intense, brief activity are met by the anaerobic processes, but it is the aerobic metabolism that supplies the energy to enable the player to last for the duration of the match. It has been estimated that 60 - 70% of the energy during badminton is derived aerobically and 30% anaerobically (Chin et al., 1995).

#### **1.3.10 AEROBIC POWER**

The term aerobic power or maximal oxygen consumption is synonymous with  $VO_{2max}$ , and is a component of cardiorespiratory endurance. It refers to the maximal amount of oxygen that can be transported and utilized by the body to produce energy aerobically while breathing air during heavy exercise. It reflects the capacity of the heart, lungs and blood in transporting oxygen to the working muscles as well as the utilization of oxygen by muscles during exercise (Heyward, 1998), and is a good indicator of aerobic fitness. Maximal oxygen consumption values obtained from research on top international badminton players are relatively high and vary from 55.7

– 73.0 mlO<sub>2</sub>.kg<sup>-1</sup>.min<sup>-1</sup> (Mikkelsen, 1979; Chin et al., 1995; Faccini and DalMonte, 1996; Omosegaard, 1996 and Majumdar et al., 1997).

### **1.3.11 ANAEROBIC POWER**

There is a low contribution from the anaerobic system in supplying the necessary energy in badminton (Hughes, 1995). According to Chin et al. (1995), approximately 30% of the energy during badminton is derived anaerobically. Although the anaerobic energy contribution in badminton is low, there is a great demand on the player's ability to tolerate high anaerobic activity for short periods of time. This is due to the fact that the rallies during a game are a mixture of push-offs, direction changes, smashes, waiting for the shuttle, walks, runs and jumps. This type of activity activates the ATP-PC system.

### **1.4 TRAINING FOR BADMINTON**

The type of training used by badminton players is generally related to the standard of the player. For younger players with less well-developed skill levels, most training is likely to be devoted to playing games. With higher skill levels comes greater dedication to the game and increased use of many potential types of training that will help competitive performance. Badminton training can be initially categorized into on court and off-court work. On court work would mean training with badminton movements with a racket and usually (although not always) with a shuttle. Off-court work is usually additional work that has the aim of enhancing some particular aspect of fitness.

### **1.5 SPECIFIC FITNESS TRAINING**

Training needs to be varied in order to enhance both physical and physiological development. Apart from general physical requirements of a badminton player specific fitness requirement has to be planned to improve upon the game. Technically, if a certain skill is developed using a range of drills, then there is a greater likelihood that it can be applied to new, unexpected situations. If a player needs to increase movement speed, then that needs to be achieved in many varied circumstances on and off the court. Clearly on-court speed is vital for the sport but general development of speed off the court will also transfer onto the court if movement technique is good.

Specific area of fitness also includes playing games 'Shadow play' (i.e., Badminton without a shuttle) Multi-feed, Conditioned games, Conditioned drills etc. The purpose of all these trainings was basically to bring the player's game to the next level and each training involves badminton drills. A badminton drill will normally involve two people. One will of course perform the drills whilst another person will feed the shuttle. In these trainings, shadow strokes are combined with actual strokes to increase skills and shot accuracy.

### **1.6 NEUROMUSCULAR TRAINING**

Neuromuscular training has been defined as multi-intervention programs that combine balance, strength, plyometrics, agility, and sport-specific exercises (Coughlan and Caulfield, 2007).

The neuromuscular training improves the nervous system's ability to generate a fast and optimal muscle firing pattern, which increases dynamic joint stability, decreases joint forces and relearns movement patterns and skills. The concepts include teaching athlete the movement pattern related to therapeutic exercise, thus prepare them to return to their sports activity. The basis of neuromuscular training involves three stage models consisting of cognitive, associative and autonomous stage (Ellenbecker, 1995).

### **1.7 REASON FOR SELECTION OF TOPIC**

Junior players are required to have a good physical fitness, as well as physiological profiling and stroke production that will enable successful performance at the competitive level. The aims and objective of the present study was to examine the player's physical fitness, physiological responses and simultaneously to measure the skills related variables among state level male junior badminton player. It is important to ascertain the most efficacious method for enhancing fitness performance and also to bring the player to the next level and reduce the fatigue. Further, not much research has been completed on the physiological aspects of badminton. This research proposes to examine the impact of specific skill and neuromuscular training on selected physical physiological and skill related variables among state level male junior badminton players.

## **1.8 STATEMENT OF THE PROBLEM**

The present study was to examine the impact of specific skill and neuromuscular training on selected physical physiological and skill related variables among state level male junior badminton players.

## **1.9 HYPOTHESES**

The following are the hypotheses set for the present investigation.

1. It was hypothesized that there would be a significant improvement on selected physical physiological and skill related variables due to specific skill training among state level male junior badminton players.
2. It was hypothesized that there would be a significant improvement on selected physical physiological and skill related variables due to neuromuscular training among state level male junior badminton players.
3. It was hypothesized that specific skill training would be better in improving skill related variables of state level male junior badminton players than neuromuscular training.
4. It was hypothesized that neuromuscular training would be better in improving physical and physiological variables of state level male junior badminton players than specific skill training.

### **1.10 SIGNIFICANCE OF THE STUDY**

1. The result of the study would be helpful in mounting specific skill training and neuromuscular training for state level junior badminton players.
2. It would be of enormous help for the coached and fitness trainers to opt for the specific skill training and neuromuscular training frequency for their players.
3. The finding of this study may add knowledge in the area of training methodology and exercise recommendation.
4. This information helps health professionals to select and perform the most appropriate test and testing protocols for the benefit of their clients.

### **1.11 DELIMITATIONS**

1. Thirty state level junior male badminton players were selected at randomly in the age group of 16 and 18 years.
2. The entire subject was selected from Chennai city only.
3. The criterion variables selected for the study were

#### **Dependent Variables**

#### **Physical Fitness Variables**

1. Speed
2. Agility
3. Flexibility
4. Arm strength
5. Leg explosive power

**Physiological Variables**

1. Anaerobic Power
2. Maximal oxygen uptake

**Skill Related Variables**

1. Short Service
2. Long Service
3. Forehand Clear
4. Backhand Clear
5. Volleying Ability

**Independent Variable**

1. Experimental group I - Specific Skill Training
2. Experimental group II -Neuromuscular Training
3. Control group IV - No training

**1.12 LIMITATIONS**

1. The heterogeneous characters of the subjects in hereditary and environmental factors, lifestyle and physiological stress and other factors that affect the metabolic functions were recognized as limitation.
2. All the specific skill and neuromuscular training programme was explained by the research scholar, so that the times taken by the subjects to respond and recognized as limitations of the study.

3. The uncontrollable changes in climatic conditions such as atmosphere temperature, humidity and other metro logical factors during the test were considered as limitations.

### **1.13 DEFINITION AND EXPLANATION OF THE TERMS**

#### **1.13.1 SPEED**

According to Corbin, (2007), speed is an ability to perform a movement or cover a distance in a short time.

#### **1.13.2 AGILITY**

According to Elizabeth, (2007) agility is the ability to move and change direction and position of the body quickly and effectively while under control.

#### **1.13.3 ARM STRENGTH**

The forearms are the muscles that provide essential grip strength, keep them in top condition is what make us strong to finish in any sports or activity involving our arm.

#### **1.13.4 FLEXIBILITY**

A person's flexibility refers to the ability of his joints to move through a full range of motion (Paige, 2008).

#### **1.13.5 LEG EXPLOSIVE POWER**

Measuring the distance between a person's standing reach and the height he or she can jump and reach has been proposed as a test of leg explosive power.



### **1.13.6 MAXIMAL OXYGEN UPTAKE**

VO<sub>2</sub> max is the maximal oxygen uptake or the maximum volume of oxygen that can be utilized in one minute during maximal or exhaustive exercise. It is measured as milliliters of oxygen used in one minute per kilogram of body weight (**Elizabeth Quinn, 2007**).

### **1.13.7 ANAEROBIC POWER**

Anaerobic power is energy that is stored in muscles and that can be accessed without the use of oxygen. There are two systems that utilize this type of power, the phosphogen system and the lactic acid system. Human beings use this form of energy in short bursts that cannot be sustained for longer than about two minutes (**Fox, 2014**).

### **1.13.8 JUNIOR**

Junior refers to male badminton players who are 18 years old or younger.