CHAPTER - I

INTRODUCTION
CHAPTER – 1

1.1 INTRODUCTION

Basketball is considered as one of the most popular sports in the world. It is played and watched by more people than any game, extending to more than 170 countries around the globe. Dr. James Naismith is known world-wide as the inventor of basketball. Basketball stands as the third fastest game played in short court surfaces. As a game of agile and explosive event in nature, a player is in need of basic fitness and motor components along with skill based drills to master in the fundamental skills and executed the same in a well defined format. For this, players have been trained with varied physical training module namely stretching exercises, resistance training, plyometric training, interval training, and combination of these and so on. Of these, plyometric and resistance training are very widely used in the game of basketball since it develops the strength and explosive power which are the major determinants of performance of a player in basketball. In this line, a player should also be sound in functional flexibility, speed, agility and cardio respiratory endurance to excel in performing the fundamental skills since basketball is also a game of agile in nature. In addition to such strength and power related training, to have the full range of motion in all joints of human body, a player has to treat with very specific stretching exercises which would help them not only to excel in execution of skills but also to be free from the sports injuries. Thus, the above said physical training modules are significantly developing the corresponding physical and motor components. Meanwhile, mere having the physical abilities for achieving the goal is a tedious task since the present world of sports is competitive.
In high level competitions, very specifically during the matches between the challenging teams, because of stress players may have an opportunity to lose their mental toughness, perception ability, concentration and apprehending the fellow players moves. As a result of this, player finds it difficult in executing the fundamental skills in time which affects the ultimate aim of the team. In this situation, when finding the alternative means and methods to develop the physical, mind and game based physical activity concurrently; it was observed that these characteristics are correlated with the event of Taekwon-do which is one of the martial activities.

The first glance of the martial art seems to be set of physical skills, but the real goal is to condition the mind. It is the mind that has to learn to act quickly. The mental benefits of martial arts are possibly more significant than the physical. As for as Taekwon-do is concerned, it can be characterized as a series of movement sequences involving punching, kicking, blocking, jumping, twisting and leaping performed at high intensity. Further, for mastering this event, an individual has to develop functional flexibility, explosive power, and limbs speed over maximal strength and a high level of anaerobic power and endurance. Thus the Taekwon-do seemed to be a highly resembling event with the game of basketball. Hence, it is believed that, to enhance the efficiency of available physical training modules in developing the physical and motor components and to avail the needed factors to excel in the game of basketball, implicating the martial arts in addition to their physical training will be a worthwhile and a right training module for the game of basketball. With these presumptions, the investigator has taken the present studied entitled “Effects of Complex Training Programmes on Physical, Physiological, Psychological and Skill Performance Variables of inter collegiate Basketball Players”; to study the effects of varied combinations of training with martial arts in the development of components that are needed for excelling in basketball.
Basketball is a game played with continuous flow of activity and has always been considered as a game of precision, timing, accuracy, and agility. Although only 15% of the playing time in a basketball game has been described as high intensity, these actions are likely to determine the outcome of a contest. (McGee, 2007) Basketball player must have tremendous cardio respiratory endurance to run up and down the court time after time for four quarters of play, but he will also need to be able to execute explosive bursts of speed, explosive jumps, and explosive movements for agility, time after time. Such an ability to perform explosively regardless of extreme cardio respiratory fatigue is called "strength-endurance". Explosive power, one of the most important components of performance related factors, helps the player to move fast, jump high, and beat out the man in front of him (Annadurai, 2005). Basketball is no longer just a game of shooting baskets and dribbling the ball around opponents. It is no longer a game of blocking shots and fast breaks. It is a complete game involving incredible levels of fitness. Having the greater intensity throughout the entire game – the player can have the ability of the faster, stronger and more enduring for the entire game. With the mastery on performance related components a player can have a higher degree of overall body strength and stamina, as well as increasing ability to hold position under the basket, rebound, increase speed and agility.

1.3 TRAINING

Training is usually defined as a systematic process of repetitive progressive exercise or work, involving the learning process and acclimatization (David, 1987). Training is the total process of preparation of a sportsman, through different means and forms for better performance. The physical training brings about local changes in the muscles, improved,
neuromuscular co-ordination of activities and a series of more general cardio-respiratory changes which aims at improving the fitness of persons and promotes the acquisition of basic movement skills (Edward, 1984). To achieve these things, training should have some basic principles. Of these the most basic principle of training is overload. Excessive overload has to be avoided because physiological systems cannot adapt to stress to extreme consistency as it refers to that most physiological systems require exposure to overloading activities three times a week or more. The required frequency of training, however, depends on the season, the athlete, activity and the specific components of fitness. The athlete might participate in endurance training six times a week and resistance training three times a week. Specificity means the effects of training that are highly specific to the participation of physiologic system overloaded, to the particular muscle groups used, and to the particular muscle fibers performing the work progression is the successful training programs plan for a steady rate of progression over a long period (Hardayal Singh, 1984). Apart from these principles, one has to give due attention to the individuality. Individuality means factors such as age, sex, maturity, current fitness level, and years of training, body size, somato type and psychological characteristics should be considered by the coach in designing each player’s training regiment.

1.3.1 TYPES OF TRAINING

In developing the physical, motor and performance-related components in football, generally players are treated with varied forms of training such as stretching exercises, resistance training, plyometric training, interval training, harness running that is speed-based training and combination of different training module. Of these, the training modules used in the present study are explained below briefly.
1.3.1.1 STATIC STRETCHING

Stretching is a form of physical exercise in which a specific skeletal muscle (or muscle group) is deliberately elongated to its fullest length (often by abduction from the torso) in order to improve the muscle's felt elasticity and reaffirm comfortable muscle tone. The result is a feeling of increased muscle control, flexibility and range of motion. Stretching, in its most basic form, is a natural and instinctive activity; it is performed by many animals including humans (Weissbort, 2006).

According to Thacker (2004) static stretching is used to stretch muscles while the body is at rest. It is composed of various techniques that gradually lengthen a muscle to an elongated position (to the point of discomfort) and hold that position for 10-30 seconds. During this holding period or directly afterwards, participants may feel a mild discomfort in muscles. Static stretching exercises involve specialized tension receptors in our muscles). When done properly, static stretching slightly less sensitivity of tension receptors, which allows the muscle to relax and to be stretched to greater length. There is doubt over the effectiveness of static stretching, with some circles of sport strongly recommending against it.

1.3.1.2 RESISTANCE TRAINING

Resistance training is a form of exercise for the development of strength and size of skeletal muscles. The resistance training, also known as weight training or strength training, is for everyone. One of the basic thrust of resistance training is to improve the functional performance of the neuromuscular system - the system of muscles and nerve pathways that direct and control movement (Pearson, 2000). In addition to this, and his organization revealed that resistance training helps to increase strength, superior movement
performance and general fitness, including enhanced function of the respiratory, cardiac and metabolic systems. Other improvements are increase in muscle mass, strengthening of connective tissue and supportive tissue as well as improvements in posture and physique (Docherty and Sporer, 2000). As psychological benefits it can boost self-confidence, increase motivation, enhance perseverance and produce a strong commitment to fitness (Tsutsumi et al, 1997)

1.3.1.3 PLYOMETRICS

Plyometric is, a type of exercise using explosive movements to develop muscular power, bounding, hopping and jumping. Plyometric exercises help as bridge the gap between strength and speed. It refers to human movement that involves an eccentric muscle contraction immediately and rapidly followed by concentric contraction. The main objective in plyometric training is to improve quickness through strength. The fast twitch or white fiber is responsible for explosive type of muscular contraction. Chu (1996) states “Plyometric has undergone a considerable metamorphosis over the past few years. New ideas and techniques will lead the reader into the second generation of plyometric training. The coach or trainer who understands the options and opportunities available through plyometric will find new ways to train athletes”. Plyometric as power training involves powerful muscular contractions in response to a rapid stretching of the involved musculature. These powerful contractions are not a pure muscular event. In fact they primarily involve and augment the nervous system. It is the combination of involuntary reflex (Myotatic “stretch-reflex”) which is then followed by a fast muscular contraction. Plyometric training is now a common element of elite sports training programmers, and is increasingly used by other athletes and their coaches.
1.3.1.4 MARTIAL ARTS

The word 'martial' derives from the name of Mars, 'the Roman god of war'. The term 'Martial Arts' literally means arts of war. This term comes from 15th century Europeans who were referring to their own fighting arts that are today known as Historical European martial arts (Anglo, 2000). Martial arts are systems of codified practices and traditions of training for combat. While they maybe studied for various reasons, martial arts share a single objective: to defeat a person physically or to defend oneself from physical threat. In fact, martial artists have a confidence, attitude, and awareness that make actual confrontations rare. Martial art is a lifetime study for many people. The path or the way of martial arts may lead the student into other disciplines, or through increasing levels in one's primary discipline. Unlike many sports or studies, there is no end to the path through martial arts.

Taekwon-Do

Taekwon-Do is one of the most popular martial arts in the world, Taekwon-do is characterized by poomses - a series of movement sequences involving punching, kicking, blocking, jumping, twisting and leaping performed at high intensity (Melhim, 2004). Functional flexibility is essential in all martial arts training and disciplines. Functional in this context, simply means flexibility that can be applied to competition. A Taekwondo competitor may be able to perform floor splits but lack strength and power in the hip flexors when raising the leg above 90 degrees. Conditioning for Taekwondo should develop functional flexibility and maintain a low body fat percentage (Heller, 1998). It should also develop explosive power and limb speed over maximal strength and a high level of anaerobic or power endurance is crucial.
1.3.2 RESISTANCE TRAINING WITH PLYOMETRIC TRAINING

According to Hakkinen (1998) the strength training in combination with some explosive types of exercises can be recommended as a part of overall physical training to maintain the functional capacity. Combining both resistance strength training and plyometric training is to use the combination of resistance and plyometric exercises to superbly engage the nervous system and activate more fibers (Beachle and Earle, 2000). Ebban (2002) states that resistance training followed by plyometric training alternates bio mechanically similar to high load weight training exercises with plyometric exercises. This type of training describes a power-developing workout that combines weights and plyometric exercises. About ten years ago, these workouts were greeted with great acclaim as research indicated that they could significantly enhance fast twitch muscle fiber power and, therefore, produce dynamic sports performance. The logic behind this pair of exercise is that the resistance work gets the nervous system into full action so that type II b fibers are available for the explosive exercise; hence a better training benefit of complex training programme can be used in the general, specific and competitive phase of training.

1.3.3 COMBINATION OF RESISTANCE, PLYOMETRIC AND MARTIAL ARTS TRAINING

Combination of resistance, plyometric and martial arts is a highly effective form of physical training, comprising a resistance exercise followed by a matched plyometric exercise and martial arts exercises. The idea is to use the combination of resistance, plyometric martial arts exercises to superbly engage the nervous system and activate more fibers as in the case of complex training (Beachle and Earle, 2000).
1.4 PHYSICAL VARIABLES

Speed

Speed is a complex ability that is necessary to perform fast motor actions in the shortest possible time; it depends on central nervous motor programmes, which are activated by intense will power. Speed is an important factor in almost all court and field games. It can make the difference in whether a performer is able to gain an advantage over his opponent. Fast movements are performed by recruiting the fast twitch fibers, and because of their function and metabolic qualities these fibers constitute the most favorable preconditions for speed performances; for instance, successful sprinters have more than 60 percent fast twitch fibers, as a result of their genetic aptitude. Whereas deVries (1974) has stated that speed is the result of both positive and negative forces. Muscular contractions are positive forces, while air or water resistance, gravity, friction, and inertia are some examples of negative forces. Increase in speed can result from decreasing the influence of the negative forces, or both. To improve basic speed, the development of strength, reaction time, neuromuscular coordination, and flexibility would be equally important. In general the muscles must be prepared for speed performances by warming-up and stretching exercises.

Flexibility

Basketball involves short intensive movements about the joints within a small part of the full range of motion. In this game a player who has a restricted range of motion will probably realize a decrease in performance capabilities. Thus good flexibility is essential for a successful physical performance and is important in prevention of injury to the musculotendinous unit, and they will
generally insist that stretching exercises can be included as part of the warm-up before engaging in strenuous activity (Prentice, 1993).

Flexibility depends on the activities in which he desires to participate. Most activities require more than normal (or average). From research and practical experience, it can be concluded that a normal amount of flexibility throughout the body is desirable in all athletic performances and some activities demand large degrees of flexibility in specific body regions. By seriously analyzing the task to be accomplished, the coach or athlete can determine which body regions need additional flexibility to achieve maximum performance; a limb must be able to move through a non-restricted range of motion (Shellock and Prentice, 1985). Always good flexibility is associated with good sporting performance in all activities where maximal amplitude of movement is required to achieve the best technical effects. Similarly, a limited range of movement can reduce work efficiency in all types of physical activities (Scott, 1999).

**Muscular strength**

Strength underlies all motor performance. In an isolated sense, strength may be thought of as the capacity of a muscle or group of muscles to exert maximum pressure, or force, against a given resistance in a limited period of time. Strength is relatively easy to increase, if one follows some fundamental guidelines to build strength, one uses relatively few repetitions (5 to 10 to 12, depending on age) and maximal resistance. Moving through the range of motion against resistance (isotonic) is thought to be more effective than static muscle actions against resistance (isometric) because strength builds "specifically" (specificity of training). When one performs a strength exercise in a single position, strength increases, but almost exclusively for that position and not for other positions. For this reason most of the strength exercises in the basic
program require movement through the full range of motion to ensure the buildup of strength at all joint angles. In addition, most of the strength exercises in the basic program involve slow movement through the full range of motion (Marcia. 2004).

**Cardio respiratory endurance**

Cardio respiratory endurance refers to the ability to sustain work for prolonged periods. In basketball, the system of the game is as much as fast which plays an extra demand on the cardio respiratory systems. During competitive matches, these systems attempt to supply oxygen to the working muscles. Most of this oxygen is used to produce energy for muscular contraction.

According Wilmore (2004) the kind of endurance associated with cardiorespiratory system is characterized by a physiological fitness, and is related to the phenomenon of 'wind'. In this instance, exercise is carried on for sufficient duration and intensity, to stress the circulatory and respiratory systems. Such endurance enables the individual to sustain moderate contraction of the skeletal muscles over a comparatively long period of time. The adjustment in the heart, lungs and circulatory systems just mentioned can be made more efficient through training.

**Agility**

Agility is important in all activities that require quick changes in positions of the body and its parts. Fast starts and stops and quick changes in direction are fundamental for good performance in practically all court games, such as basketball, tennis, badminton, and volleyball, and many field games, such as soccer, football, and baseball. These games require running agility. In
the majority of activities, performance will improve with increased agility (McGee, 2007). Agility enables an individual to rapidly and precisely alter the position and direction of the body and is an important ingredient for successful participation in wide variety of sports. An agile person can quickly and efficiently mobilize the large muscle groups of the body in order to make rapid changes in direction of movement. One of the most important factors influencing movement is agility. This factor is revealed by the ability of the body or parts of the body to change directions rapidly and accurately. Agility involves coordinating quickly and accurately the big muscles of the body in a particular activity. One’s level of agility is probably a result of both innate capacity and training and experience. It is revealed to a great extent in sports involving efficient footwork and quick changes in body position force (Barrow and McGee, 1979).

**Explosive power**

Successful sporting performance at elite levels of competition often depends heavily on the explosive leg power of the athletes involved. Vertical and horizontal jumping, in its many different forms, requires high levels of explosive muscular power. Power is the equivalent of explosive strength. "Speed - strength" synonymous with power. In team sports require high levels of explosive power, such as Basketball, Volleyball, Netball and the Rugby and Football for success at elite levels of competition. Explosive power comes from the development of speed and strength. Paavolaienen et al (1999) suggested that muscle power is the ability of neuromuscular system to produce power during maximal exercise when glycolytic and oxidative energy production is high and muscle contractility may be limited. As for as its importance in basketball is concerned to excel in the performance of rebounding and shooting, a player is in need of good explosive power since to jump vertically.
According to (Matavulj, 2001) the strength of the muscles in the limbs is moving and supporting the weight of the body repeatedly over a given period of time in terms as dynamics strength, sometimes, it has been called velocity or speed. The important aspect of this factor is the requirement that the muscular force must be repeated as many times as possible. Explosive strength and dynamic strength involve movement of the body or of its limbs.

**Blood pressure**

Blood pressure is the pressure exerted by the blood against the walls of the arteries. This pressure is created by the contractions of the heart and it is that propels the blood through the blood vessels. During each heartbeat, the heart pumps a volume of blood. The ejection of this additional volume of blood into the arterial system serves to raise the pressure of blood in the arteries during systole is called systolic pressure. During diastole, the distended arteries recoil due to their elasticity and press on the blood contained in them. This serves to maintain the arterial blood pressure during diastole although no blood is being pumped in the arteries by the heart in diastole is called diastolic pressure. The maximum blood pressure during contraction of ventricles is called systolic blood pressure. The minimum blood pressure during relaxation of ventricles is called diastolic blood pressure (Wilmore, 2004).

**Maximum oxygen uptake (VO2 Max)**

Maximum oxygen uptake (VO2 max) refers to the highest rate at which oxygen can be taken up and consumed by the body during intense exercises. Traditionally, the magnitude of an individual’s VO2max has been viewed as one of the most important predictors of endurance. The ability of the cardio respiratory system to transport oxygen to the exercising muscles refers to the central component of VO2max. The role of the central component is for oxygen
to be transported from the atmosphere and delivered to the muscles where it is utilized during mitochondrial respiration to produce ATP. The major limitations to oxygen delivery are pulmonary diffusion, cardiac output, blood volume and flow. An individual who is fit will have a cardio-respiratory system that is capable of meeting the demands of the tissues under conditions of intense exercise (William, 2001).

Psychological variables

Usually in a competitive situation, the probability is, both teams possess nearly the same physical skills and fitness level. But beyond that the winner is determined by mental preparation. The future records will be broken primarily because of increased attention to the psychological parameters of human personality.

Anxiety

Anxiety is in reality a relationship occurring through time between a person and the situation he or she faces. It can be referred to as the behavioral and physiological responses directly induced by a situation. Specific symptoms of the anxiety expectation includes heart palpitation, disturbances of respiration, sweating, tremor and shuddering, vertigo and other physiological and behavioral manifestations.

Apart from the generalization, in day to day human life and in sports and games, anxiety plays very crucial role as a determinant factor. Smith (1989) cited anxiety as a product of stress and persistent feature of competitive sport. It can be a positive factor as accorded by the need to reach and maintain the optimal arousal prior or during the event or a negative one as evident in both externally derived pressures such as meeting the expectation of coaches,
fans and teammates and internal emotions. When these unpleasant sources of stress are chronic, the output may lead to burnout, demotivation, poor sports performance, and eventual withdrawal of the athlete from competitive sport.

**Self confidence**

According to Susan Milam (2000) an athlete's level of self-confidence is often a determining factor of whether or not he or she has a peak performance. However, an athlete's positive self-confidence doesn't just happen; it has to be developed over many years. It is often the result of a positive learning environment and positive self-talk. A positive learning environment is important in the development of self-confidence because people learn by watching. One way to start building self-confidence is to improve physical skill. Physical skill typically improves through practice. There are two general types of practice that can be used, blocked practice and random practice. With blocked practice, the athlete practices the skills over and over. It is a great technique used for beginners to help build self-confidence. The other type of practice is referred to as random practice, and tends to be used with more skilled athletes. This is where the athlete practices different skills.

**Skill Performance**

All physical education activities may be considered as skills or as being comprised of skills and the degree of proficiency attained by the individual reflects his skill level. Skill is the product of skill, speed, accuracy, form and adaptability. It has several fundamental skills. The mastery of the fundamental skill is very essential in improving the standard of the game. Besides the fundamental skills, the game is a team effort, requiring team offence and team defense.
Shooting ability

Shooting is the act of attempting to score points by throwing the ball through the basket. While methods can vary with players and situations, the most common technique can be outlined here. The player should be positioned facing the basket with feet about shoulder-width apart, knees slightly bent, and back straight. The player holds the ball to rest in the dominant hand's fingertips (the shooting arm) slightly above the head, with the other hand on the side of the ball. To aim the ball, the player's elbow should be aligned vertically, with the forearm facing in the direction of the basket. The ball is shot by bending and extending the knees and extending the shooting arm to become straight; the ball rolls off the finger tips while the wrist completes a full downward flex motion. When the shooting arm is stationary for a moment after the ball released, it is known as a follow-through; it is incorporated to maintain accuracy (Fox, 1998).

Dribbling ability

Dribbling is the act of bouncing the ball continuously, and is a requirement for a player to take steps with the ball. To dribble, a player pushes the ball down towards the ground rather than patting it; this ensures greater control. When dribbling past an opponent, the dribbler should dribble with the hand farthest from the opponent, making it more difficult for the defensive player to get to the ball. It is therefore important for a player to be able to dribble competently with both hands. Good dribblers (or "ball handlers") tend to bounce the ball low to the ground, reducing the travel from the floor to the hand, making it more difficult for the defender to "steal" the ball. Additionally, good ball handlers frequently dribble behind their backs, between their legs, and change hands and directions of the dribble frequently, making a less predictable dribbling pattern that is more difficult to defend. A skilled player can dribble without watching the ball, using the dribbling motion or peripheral
vision to keep track of the ball's location. By not having to focus on the ball, a player can look for teammates or scoring opportunities, as well as avoid the danger of someone stealing the ball from them (Fox, 1998).

1.5 BRIEF REVIEW OF THE STUDY

Numerous studies have investigated the fitness and functional performance training on improving muscular fitness and functional performance in the adults and similarity marked evidence indicates that regular participation in plyometric training programme can improve measures of strength and power in adults (Fleck and Kramer, 2004; chu, 1998). In this line Adam et. al.(1992) have also observed that the changes on motor performance skills resulting from the performance of combined resistance training and plyometric are greater than with either type of training. According to Myer and Gregory (2005) who observed that a six week, multi – component training programme which included resistance training, plyometric training and speed training significantly enhanced strength, jumping ability and speed in female adolescent athletes as compared to a non – exercising control group. To our knowledge, no prospective studies have compared the effects of multi – component training programme using the movements underlies the game of basketball such as Takenwon-Do one of the martial arts in addition to the resistance and plyometric training to have the better performance on performance related components and skill performance of inter collegiate male basketball players. Thus the research scholar is motivated to take up this kind of multi-component training programmes in the present study.
1.6 OBJECTIVES OF THE STUDY

The objectives of the study were as follows.

1. To determine the individualized effect of complex training namely static stretching with resistance training, plyometric training with resistance training and combination of plyometric training, resistance training with martial arts training on changes occurred from their base line to after twelve weeks of training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

2. To compare the effects of complex training namely combination of static stretching exercises with resistance training, combination of plyometric with resistance training and combination of plyometric training, resistance training with martial arts training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

3. To compare the effects between the combination of static stretching exercises with resistance training and combination of plyometric training with resistance training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

4. To compare the effects between the combination of plyometric training with resistance training and combination of plyometric training, resistance training with martial arts training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.
5. To compare the effects between the combination of static stretching exercises with resistance training and combination of plyometric training, resistance training with martial arts training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

1.7 STATEMENT OF THE PROBLEM

The purpose of the study is to determine the effects of complex training programmes of static stretching exercise with resistance training, plyometric training with resistance training and combination of plyometric training, resistance training with martial arts training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

1.8 HYPOTHESES

The formulated hypotheses in the present study were as follows

1. It was hypothesized that each training module of the complex training used in the present study namely static stretching with resistance training, plyometric training with resistance training and combination of plyometric training, resistance training with martial arts training may have significant improvement from their base line to twelve weeks of training on selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

2. It was hypothesized that there may be a significant mean difference among the groups namely static stretching with resistance training, plyometric with resistance training and combination of plyometric
training, resistance training with martial arts training and control group in developing the selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball players.

3. It was hypothesized that twelve weeks of combination of plyometric training, resistance training with martial arts training would lead to significant improvement in selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball player than the static stretching with resistance training.

4. It was hypothesized that twelve weeks of combination of plyometric training, resistance training with martial arts training would lead to significant improvement in selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball player than combination of plyometric training with resistance training.

5. It was hypothesized that combination of plyometric training with resistance training would lead to significant improvement in selected physical, physiological, psychological, skill performance variables and overall playing ability of inter collegiate male basketball player than static stretching with resistance training.
1.9 SIGNIFICANCE OF THE STUDY

The present study is significant in the following aspects:

1. Players can be benefited by identifying their level on factors related to physical, physiological, psychological, and skill performance that are underlying the performance of basketball used in the study.

2. The outcomes of the present study help the sports development authority of Tamilnadu to implement the same with their exiting training structure.

3. The present study helps the physical education teachers and coaches to identify the influence of martial arts training and implicate the same in their training schedule to enhance the performance of players.

4. As for as movements of martial arts training are concerned, the functions of both physical and mind will have equal in importance. Hence, such a balanced function of both body and mind would have significant impact in the execution of skills that are highly underlined with balance and coordination.

5. As earlier studies confirmed that the martial arts training helps the participants to gain in self confidence psychologically, implication of this in the sports training module will motivate the participants as the effect of concomitant learning.

6. Since the present study is innovative one by inclusion of martial arts training into the physical exercise training this approach would have a source to familiarize the various methods of martial arts training.
1.10 **DELIMITATIONS**

The present study was delimited in the following aspects

1. The present study was confined to male basketball players at inter-collegiate level.

2. The total number of subjects for the present study was eighty. They were divided into four groups. Each group consisting of 20 subjects.

3. As far as variables used in the present study were concerned, it was delimited to speed, flexibility, muscular strength and endurance, cardio respiratory endurance, agility and explosive power (physical), systolic blood pressure, diastolic blood pressure, VO₂ max, resting pulse rate (physiological), cognitive anxiety, somatic anxiety, self confidence (psychological), shooting ability, dribbling ability (skill performance) and overall playing ability.

4. In measuring the psychological variables as list to measure, the present study was delimited to Competitive State Anxiety Inventory-2 (Martens, 1987).

5. The administration of pre-test on subjects was confined to the competitive nature.

6. To have a quality of data on the criterion variables, to select the degree of competition, it was confined to at par competition.

7. As far as duration of the treatment is concerned, the period was delimited to five days a week and twelve weeks in total.
1.11 LIMITATIONS

The present study was limited in the following aspects

1. The diet, atmosphere and temperature were not taken into consideration.

2. The skill performance and background experience in the martial arts (taekwondo) were not taken into consideration.

3. The influence of environmental factors on collection of data and the effect of treatment used in the present study were not taken into account.

1.12 DEFINITION OF TERMS

Speed

Speed is a fast motor action in the shortest possible time. Speed may be defined as the capacity of an individual to perform successive movements of the same pattern at a fast rate

Flexibility

Flexibility is the ability range of movement in a joint

Muscular Strength and Endurance

Strength is the capacity of the individual to exert muscular force. Muscular endurance is the ability is to a muscle or group of muscles to certain repetitive contraction over a long period of time.
Cardio-Respiratory Endurance

Cardio respiratory endurance refers to the ability to sustain work for prolonged periods. The ability of the blood vessels, heart and lungs to take in transport, and utilize oxygen.

Agility

The ability of the body or parts of the body to change directions rapidly and accurately.

Explosive power

Explosive power is the capacity of the individual to release maximum force in the shortest period of time.

Blood pressure:

Blood pressure is the pressure in a blood vessel or the force that the blood exerts against the wall of vessels.

i) Systolic Pressure:

Systolic Pressure is the highest level in which the arterial blood pressure raises following the systolic ejection of blood from the left ventricle.

ii) Diastolic Pressure:

Diastolic Pressure is the lowest level in which the arterial blood pressure fall in the interval between successive hearts beat.
Max oxygen uptake (VO₂)

VO₂ max is the maximum amount of oxygen consumption during exercise or physical activity.

Resting Pulse Rate

The regular movement of blood as the heart pumps it round the body.

Anxiety

Anxiety as “a tensional state of such severity that work efficiency was interfered with and medical advice was sought, and which was characterized by one or more of the following complaints. Persistent feelings of tension and strains, irritability, unremitting, worry, restlessness, inability to concentrate, feelings of panic in every day life situations”

Cognitive anxiety

Cognitive anxiety expressions encompass worries or concerns about their adequacy and consequences of one’s performance.

Somatic anxiety

Somatic state anxiety is a measure of one’s perceptions of his physiological assessment such as heart rate and brain wave activity.

Self confidence

Self confidence is a state or quality or being confident certain of one self or one’s abilities.
Shooting ability

Shooting is the act of attempting to score points by throwing the ball through the basket. Shooting is one of the most fascinating offensive skills. The objective of offense is accurate shooting – to throw the ball through the basket defended by the opponent.

Dribbling ability

Dribbling is the act of bouncing the ball continuously. Dribbling is the only method for moving with the ball and one of the integral parts of offensive skills of Basketball. Dribble is executed using the hand farthest from the opponent, effectively without looking at the ball.

Training

Generally training is understood as a synonym of doing physical exercise. In narrow sense training is doing exercise for the development of performance.

Resistance training

Resistance training is a specialized method of conditioning designed to increase muscle strength, muscle endurance and muscle power. And also it’s a form of exercise for the development of strength and size of skeletal muscles.

Plyometric training

Plyometric is a type of exercise training designed to produce fast, powerful movements, and improve the functions of the nervous system, generally for the purpose of improving performance in a specific sport.
Martial arts

The term 'Martial Arts' literally means arts of war'. Martial arts are systems of codified practices and traditions of training for combat, to defeat a person physically or to defend oneself from physical threat.

Taekwon-do

Taekwon-do is characterized as a series of movement sequences involving punching, kicking, blocking, jumping, twisting and leaping performed at high intensity.

Stretching

Stretching is a form of physical exercise in which a specific skeletal muscle (or muscle group) is deliberately elongated to its fullest length (often by abduction from the torso) in order to improve the muscle's felt elasticity and reaffirm comfortable muscle tone.

Complex training

Complex training denotes practice of static stretching followed by resistance training or plyometric training followed by resistance training or plyometric training, resistance training followed by martial arts training.