CHAPTER – I
INTRODUCTION
CHAPTER – I

1.0 INTRODUCTION

The “Game of Football” is a highly competitive one. It is one of the very popular sports since it is attracting a huge mass in the world. As for as the success of this game is concerned, the factors primarily needed are identification of right type of players and treatment of them with right type of training module. Basically the players are treated with varied training modules to develop basic fitness and performance-related variables. By this way the players can develop the abilities in the adaptability pertaining to fitness and performance-related parameters. It can be an acceptable form for the basic level. But when the player goes for higher level, they are in need of a treatment with the combination of varied training module with varied nature of intensity, load, frequency and duration. Because the specificity of the principle states that the nature of tissue adaptation after training, is dependent on the specific type of training practices (Babchle (1994), Brooks (2000) and Newman (2003). As evidence to this principle, combining two types of training may interfere with training response -by either of the type training alone. Reasonable physiologic and metabolic evidences exist to support this principle. This is the non periodized training program. In this case, the trainers rarely keep the training volume and intensity constant throughout the year instead the volume and intensity are varied cyclically within training cycles which is termed as periodization (Urgener, 1994).

Periodization based training keeps varying in training program at regular intervals in an attempt to bring out optimal gains in fitness and components
related to performance. The goal of periodized training is to optimize training during short as well as long periods of time. To date, the majority of studies on periodization can result in greater changes in strength, motor performance and body composition than the non periodized training program (Fleck, 1994). However, studies are needed to examine how periodized training is more beneficial than non periodized training as it was stressed in the study of Fleck (1994). With this conceptual aspect, the investigator has intended to implicate the periodized training program with varied training modules of Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training, and Combination of Periodization and Speed-based cum resistance cum plyometric training modules to bring out the needed factors that are essential for peak performance in football. For this, the investigator has designed the present study titled Effects of Periodized, Speed Based and Combination of Periodized and Speed-based Resistance cum Plyometric Training on Performance-related variables, Skill Performance Variables and Overall Playing Ability of Football Players.

1.1 NATURAL OF THE GAME

Football is the sport that leads. It is no miracle but it promotes passion and love. Football encompasses millions of players, coaches, scientists, administrators, physical education teachers, politicians and inevitably parents of young players. This “simple” game that requires a ball and a goal is not only the game of heroes but also of those who bear a childish enthusiasm that makes dreams come true. Skills include heading, tapping, passing and shooting but each of the football codes has its own unique skills. From Ronaldinho’s
“elastico” (stretching an opponent one way and pass him on the other at top speed) to Zidane’s “roulette” (360-degree turn at high-speed to dribble past an opponent) watching the game is more exciting than any other entertainment on the planet. Scientists cannot control all the variables involved but may measure the social, psychological and physical strength of the players. Still a trainer armed with information may go through the challenge with small and/or no losses. The profound beauty of football in any of its codes lies in the fact that football requires power, accuracy and coordination. Unlimited options are assessed, decisions are taken and action is conducted in less than seconds during the course of every game whether it is played in a street or in a stadium that holds hundred thousands. This is not only done by “the black antelopes” of Angola but also by children of age five to veteran adult players of 75 years. The scale of association football, for example, is evident in more than 200 nations; Federation Internationale de Football Association (FIFA) has 207 members as of 2006 whereas United Nations has 191 members:

Football is generally a free-flowing game, which is discontinued only when the ball has left the field of play, or when play is stopped by the referee. After a stoppage, the play recommences with a specified restart. In typical game play, the players attempt to propel the ball towards their opponents' goal through individual control of the ball, such as by dribbling, passing the ball to a team-mate, and by taking shots at the goal, which is guarded by the opposing goalkeeper. Opposing players may try to regain control of the ball by intercepting a pass or through tackling the opponent who controls the ball; however, physical contact between opponents is limited. In some situation, the player has to pass the ball for long distance to his fellow players and has to vigil
on the ball till the game is over for nearly one and half hours. The major moves
in the game of football enhance the players to be sound in physical,
physiological and psychological aspects. Thus this game is naturally imbibed
with high level aerobic and anaerobic aspects.

1.1.1 Characteristics of Football Players

As physical characteristics, speed, strength and endurance deserve
considerable attention in performance. In football strength is a very basic
requirement for a player as he needs to make power when kicking a ball for
long distance or shooting at the goal. Thomas Reilly (1990) insists that strength
in lower limbs is of obvious concern in football. Quadriceps and hamstrings
muscles are most used muscles for jumping, kicking, and tacking. Upper body
strength is employed in throw-in and the strength of the neck flexors is
important for heading the ball forcibly. Thus a football player must work with
strength training programme as it brings about beneficial changes on the
adaptation process. Similarly, speed is also a needed factor as it helps convert
the strength into power which is essential for successful performance in
football. In football, the lighter team wins because it is the faster team and the
frequency of sprints in football players is eleven percent of their total
movement in a full game. The frequency of sprints tends to be greater in
 strikers and midfielders than on backs. They tend to sprint often to collect the
ball or to defend the ball. Football players must manage both his body and the
ball with his feet and have to move with varied speeds and directions.
1.1.2 Skills in Football

In football, skills have come into play an increasingly vital role in the quest for victory. Top level teams perfect the skills and change them into a highly refined and sophisticated art and are constantly searching for better training. There are number of skills involved in the game of football like passing, dribbling, kicking, ball control, volleying, trapping, heading, goal keeping and applications to different situation. Skills are indispensable for maximum use of the motor abilities. Perfection of these skills and execution of them successfully are having direct impact on the total performance in the game.

1.2 PERIODIZATION

Periodization is an organized approach to training that involves progressive cycling of various aspects of a training program during a specific period of time. The roots of periodization come from Hans Selye’s model, known as the General Adaptation Syndrome, which has been used by the athletic community since the late 1950s (Fleck, 1999). Selye identified a source of biological stress referred to as eustress, which denotes beneficial muscular strength and growth, and a distress state, and can lead to tissue damage, disease and death. Over 2000 years ago, the ancient Greeks were the first to use periodization training, although their periodization plans were very simple (They simply increased their total training load over time, using heavier and heavier weights and resistances, for example, to train strong athletes who were preparing for the Olympic games). After the Greeks, periodization training theory entered a 1990 year lull, only to be revived earlier in this century. The
USSR since during the Russian Revolution has literally led the world in the development of periodization theory. The Russians have also enjoyed one key advantage over other countries; they have actually tested various periodization schemes with large number of their international athletes and have accumulated an extensive amount of practical information about periodizing training properly.

The earliest periodization training schemes utilized by the Russians in the 1920s and 1930s were logical but pretty basic; their exercises which scientists theories proved that training should be divided into what they called - general, preparatory and specific phases. The general state of training, which often lasted for about two months or so was supposed to develop the heart and lungs. The preparatory training, also which prolong for two months duration, sought to boost muscle strength and endurance and the specific period about eight months prepared an athlete for individual sporting event by emphasizing extensive practice of the precise movements involved in the sport.

1.2.1 Need of Periodization

Periodization is a method for structuring training programs using cycles of stimulating loads, maintenance loads, detraining loads and rest to elicit improvements in fitness and performance. It allows for a planned variation in training program, while maintaining a coherent structure. It results in increasing recovery and recuperation potential and shows measurable progress in strength gains. Periodizing the training is the key. Instead of doing the same routine month after month, one can change training programs at regular intervals or “periods” to keep one’s body energetic, while still giving adequate rest. Thus
one has to alter the strength training program by adjusting the variables such as the number of repetitions per set or the number of sets of each exercise, the amount of resistance used, the rest period between sets, exercises or training sessions, the order of the exercises, or the type of exercises and the speed at which one completes each exercise. Periodization is most widely used in resistance program design to avoid over-training and to systematically alternate high loads of training with decreased loading phases to improve components of muscular fitness (e.g. strength, strength-speed, and strength-endurance).

1.2.2 Nature of Periodization

Part of a periodized plan undergoes decrease in quality and quantity and goes through a period of active rest resulting in a greater state of readiness to handle a higher training load. Including rest periods in training program is especially beneficial when training is alone with high intensity and/or high volume. Improvements in fitness (as measured by increased strength or endurance) occur during the rest period, not during the training itself. Positive physiological adaptations to training result from correctly timed alternations between stress and regeneration. After a controlled training overload, there is a period when the body adapts to the overload and works to reestablish homeostasis. After it has adapted to the overload, the body is capable of doing more work for an equivalent homeostatic displacement. The basic aim of training, therefore, is to apply a series of stimuli that will displace the homeostasis of the body's functional systems and provide a stimulus for adaptation and super compensation. If the training stimulus is too small in
either intensity of duration, little or no adaptation will take place. However, if
the stress is too severe, the adaptation will be delayed or even prevented.

1.3 TRAINING

Training is a programme of exercises designed to improve the skills and
increase the energy capacities of an athlete for a particular event (Edward
1984). The term ‘Training’ is widely used in sports. Some experts especially
belonging to sports medicine understand sports training as basically doing
physical exercise. Training is the total process of preparation of a sportsman,
through different means and forms for better performance (Hardayal Singh
1983).

1.3.1 Principles of training

According to Hardayal Singh (1984) training aims at improving the
fitness of persons and promotes the acquisition of basic movement skills. To
achieve these things, training should have some basic principles. Of these the
most basic principle of training is overload. Most physiological systems can
adapt to functional demands that exceed these encountered in normal daily life.
Training often systematically exposes selected physiological systems to
intensities of work or function that exceed those to which the system is already
adapted. Excessive overload has to be avoided because physiological systems
cannot adapt to stresses to extreme consistency as it refers 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. There is no
substitute for consistency in a training program. The athlete might participate in
training that are highly specific to the participation of physiologic system overloaded, to the particular muscle groups used, and to the particular muscle fibres performing the work progression is the successful training programs plan for a steady rate of progression over a long period. The athlete has to improve over several years of participation; the training program must progress so that the appropriate physiological systems continue to be overloaded. However, too rapid an increase of the training stress may lead to exhaustion and impaired performance.

Apart from these principles one has to give due attention to the individuality. Individuality means factors such as age, sex, maturity, current fitness level, years of training, body size, somato type and psychological characteristics should be considered by the coach in designing each athlete’s training regiment.

1.3.2 Aims of Sports Training

The major aim of sports training is to achieve high level performance. The sports performance depends largely on physical fitness and motor fitness. The physical fitness can be differentiated into general and specific fitness. Each sports activity demands different types and level of different motor abilities and when a sportsman possesses these, he is said to have the specific physical fitness of various motor abilities, regardless of any sports which the sportsman possesses. The contribution of physical fitness towards sports performance is indirect. But it should never be overlooked that specific physical fitness depends largely on the general physical fitness (Hardayal Singh (1983).
1.3.3 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 resistance training, plyometric training, interval training, harness running that is speed-based training and combination of training. Of these, the training modules used in the present study are explained briefly as follows.

1.3.3.1 Resistance Training

Resistance training is a form of exercise for the development of strength and size of skeletal muscles. Resistance training, also known as weight training or strength training, is for everyone. According to the American Sports Medicine Institute (ASMI1998) resistance training is a “specialized method of conditioning designed to increase muscle strength, muscle endurance, and muscle power”. Resistance training can be performed in a variety of ways; with resistance machines, free-weights (dumbbells and barbells), rubber tubing, or own body weight, as in doing pushups, squats or abdominal crunches.

Benefits of Resistance Training

As the goal of resistance training, the ASMI(1998) says, is to “gradually and progressively overload the musculoskeletal system so it gets stronger”. Regular resistance training will strengthen the bones, and it builds well on strengthen the muscles. According to Keith Cinea, any fitness program should include resistance training, along with aerobic exercise and flexibility training. Aerobic workouts, which strengthen the cardiovascular system, focus primarily on the large muscle groups of the lower body. Strength training offers a way of
balancing that out by challenging all the major muscle groups, including those in the chest, arms, back and abdomen. According to medical research, generally the resistance training strengthens the muscular system, strengthens the skeletal system, and improves bone density (decreases the chance of osteoporosis) and increases metabolism. So a well-planned resistance training program should be a part of everyone's health, fitness and lifestyle regardless of age, gender or goals.

According to Moritani and Devries (1979) resistance training improves the functional performance of the neuromuscular system - the system of muscles and nerve pathways that directs and controls movement. Resistance training produces increased strength, superior movement performance and general fitness, including enhanced function of the respiratory, cardiac and metabolic systems. Other improvements include an increase in muscle mass, strengthening of connective tissue and supportive tissue as well as improvements in posture and physique. Structuring a resistance training program with Burke Spencer's Fitness Partner encourages the lifetime physical activity in students ages 8+ to improve neural motor skills and strength, to improve bone development by increasing bone density to improve the strength of bone connective tissue to strengthen the heart muscle and as improve muscle energy capacity.

1.3.3.2 Plyometric Training

For many years coaches and athletes have sought to improve power in order to enhance performance. Throughout this century and no doubt long before, jumping, bounding and hopping exercises were especially used in
various ways to enhance athletic performance. In recent years this distinct method of training for power or explosiveness has been termed Polymerics. Plyometrics by definition is, a type of exercise using explosive movements to develop muscular power, especially bounding, hopping and jumping. It is a term that describes exercises that help to bridge the gap between strength and speed, and refers to human movement that involves an eccentric muscle contraction immediately and rapidly followed by concentric contraction. When a muscle is lengthened, energy is released as heat, but some energy is stored in the muscles and tendons to be used in its subsequent contraction. The goal is to decrease the amount of time it takes for the muscle to contract in a movement. Again the focus is on time. If the muscle is stretched for too long, useable energy is lost as heat.

Santana Juan Carlos (2000), plyometric training is a "explosive-reactive" and a power training that involves powerful muscular contractions in response to a rapid stretching of the involved musculature. These powerful contractions are not a pure muscular event; they have an extremely high degree of central nervous system involvement. The event is a neuromuscular event. It is a combination of an involuntary reflex (i.e. a neural event), which is then followed by a fast muscular contraction (i.e. voluntary muscular event). The main objective in plyometric training is to improve quickness through strength. The fast twist or white fibre 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."
1.3.3.3 Resistance Training with Plyometric Training

According to Hakkinen et al. (1998) the strength training in combination with some explosive types of exercises be recommended as a part of overall physical training to maintain the functional capacity in middle-aged and elderly people. For explosive muscle performance, the underlying factors are muscle fibre type, muscle hypertrophy and enzymatic and neural adaptations. It is also important to investigate the impact of power-type strength training on the low back and leg muscles and joints, as well as the injury risks and adherence, and motivation to training. For being effective in improving the explosive muscle performance, training programs should be designed so as to be motivating, easy to achieve, effective concerning the time spent in exercises, low in expenses, and they should give consideration to the exercise history and present exercise activity, health status and musculoskeletal symptoms and diseases of the individual.

Combining both resistance strength training and plyometric explosive power training is to use the combination of resistance and plyometric exercises to superbly engage the nervous system and activate more fibres (Beachle & Earle (1994). 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 fibre 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 fibres 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.

**Upper Body Plyometrics**

Upper body plyometrics is believed that the stretch-shortening cycle can be activated in the upper body just as it is in the lower body. The most common method of upper body plyometrics is with a medicine ball Wilk (1993). Chu (1989) described many different medicine ball activities which allow the athlete to strengthen in ways unavailable through use of free weights. These exercises are used to develop power from sheer strength. Chu (1996) illustrated the use of upper body plyometrics as a means of training functional power through his use of medicine ball chest passes. Football players who were much stronger in the weight room, were clearly outperformed by javelin throwers who were much more accustomed to performing this powerful movement. Radcliffe and Farentinos (1999), Armstrong (1994) and many others have since developed upper body plyometric training protocols.

**Lower Body Plyometrics**

Lower body plyometrics is believed that the stretch-shortening cycle can be activated in the lower body. The most common method of lower body plyometrics is that it involves box jump, hopping, bounding, depth jump, jump and reach, jump and tug, lateral over the cones, jump using cones and hurdles. It helps develop power in any sport that involves sprinting, jumping, quick changes of direction and kicking, etc. These are most effective when completed
in conjunction with a suitable strength training program or following a phase of maximal strength training.

1.3.4 Speed-Based Training

Speed is one of the most important motor abilities for athletes and one of the major requirements in most sports. In sports such as sprinting, soccer, cycling, hockey, fencing, games and many other team sports, speed is a major factor in determining the overall outcome. Speed is obviously extremely important in all forms of racing, but also in team and goal related sports when someone has the chance to “run away” from the opposition (Hay and Reid, 1988). Speed is the most essential factor of force; it is related to strength and power. Scientifically, force equals mass multiplied by acceleration (F = MA) or (P = MV^2).

Performing sports skills economically with ease, correct positioning of body levers and good neuro-muscular coordination will result in efficient use of energy and a higher speed of the movement. In addition to relaxation ability, joint flexibility is an important ingredient for performing movements with high amplitude (e.g. long stride in running) which in many sports is essential to execute optimum range of movement for maximum speed. Speed is determined not only by mobility and well synchronized neuro-muscular response but also by the frequency of the precise nervous impulses and strong concentration. This is because quick, explosive movements depend on a high level of power. Willpower and strong concentration are very important factors in achieving high speed. Exercises of will must be included in the training process to achieve a high level of speed.
1.3.5 Periodized Strength Training

Considering the popularity of Periodized training, there are surprisingly few studies examining the effectiveness of Periodized resistance training. (Siowers.T.J. et.al. 1983, Barker et.al 1984, Steven J. Fleck 1999). The Periodization programme that progressed from high volume and low intensity to lower volume and higher intensity training.

The concept of periodized strength training has been utilized by the athletic community at least since the late 1950s. Periodized strength training refers to varying the training program at regular time intervals in an attempt to bring about optimal gains in strength, power, motor performance and / or muscle hypertrophy. A goal of periodized strength training is to optimize training during short (e.g. weeks, months) as well as long periods of time (e.g. years, a lifetime, or an athletic career). The training variables that can be manipulated in an attempt to optimize the training program include number of sets performed of each exercise, number of repetitions per set, exercises performed, number of exercises performed per training session, rest periods between sets and exercises, resistance used for a set, type of muscle action performed (e.g. eccentric, concentric, isometric), and number of training sessions per day and per week.

The term intensity is frequently used when describing weight-training programs to refer to the weight lifted of repetition maximum weight used to perform a certain number of repetitions (repetition maximum, RM). The highest intensity that can be used is a one repetition maximum weight. A weight allowing the performance of more than one repetition of an exercise is thus a
lower training intensity. The term training volume will be used in reference to the total number of repetitions per set, and number of repetitions implies a higher training volume. Unfortunately, despite the virtually limitless combination of these training variables, the majority of studies examining the effectiveness of periodized training have focused on strength / power gains and manipulated only training intensity and training volume.

1.4 PERFORMANCE-RELATED COMPONENTS

Speed

In the game of football speed is the quickness in reaction what he sees in the game. Speed in soccer can be quite complex. It certainly entails more than just running fast. When talk about speed in football, here are some of the attributes that will make a better player; quick speed off the mark, quick acceleration over ten to fifteen yards, good speed endurance, speed in possession of the ball, quickness of feet or agility, the ability to change direction quickly and the ability to execute skills quickly. It can be seen that, the good hundred meters sprinters do not necessarily have the attributes to be quick soccer players.

Absolute speed is determined by a number of factors - the obvious one being genetics. A good soccer speed training program will improve the efficiency of muscle fibres (if not the type or amount of them) and that will make faster. So, one goal of soccer speed training schedule should be to increase sprinting power - particularly acceleration and speed off the mark. Soccer players rarely sprint more than fifty yards in a straight line. A second, and equally important, goal is to increase speed endurance. Speed endurance
training significantly improves recovery after a bout of repetitive sprints. Thirdly, a soccer speed training program should improve agility, foot speed and reaction time. Exercises to improve agility do not tend to be physically taxing. The emphasis is on short, sharp movements of a high quality finally, incorporating a ball into some of the speed and agility drills is important to make all those gains in speed transferable to the field of play.

**Strength**

Strength is the most important element in motor performance. Strength is a consistent differentiator of ability to make and to achieve success in sports. It is the ability to overcome resistance or to act against resistance. Muscle strength is that which acts when the nervous system communicates a message to the muscle fibers to contract so as to produce force. It is in fact a product of voluntary muscular contractions caused by the neuromuscular system. Strength should be a significant part of training young, elite or recreational athlete. strength has direct or indirect influence on most of the abilities needed for performance. The abdominal strength is very much useful in the field of sports and games. When an individual possess a high degree of abdominal strength, he will be able to perform any type of activities such as running, jumping and throwing. The abdominal strength helps to maintain the body postures, thereby involving in many activities in the field of sports and games.

Hence the young players develop strength through natural, unbroken movements such as jumps, throws and other body weight exercises. Strength training serves not only to improve overall performance, but also to secure the body and help the players avoid injury. Proper strength training has the
potential to increase soccer performance, and that strength training should therefore be an integral part of all soccer players.

**Leg Strength for Sport Performance**

The legs are the primary source of power in many sports. In majority of situations they function as part of a closed kinetic chain which means that one leg is always in contact with the ground. Without functional leg strength the athlete can not have speed, strength, power or suppleness to perform. It is to think of the legs as a functional unit of the whole kinetic chain. "Function is a miraculous and complex combination of systems that are linked so that they react with each other. In order to understand function as a whole, the parts and components of function must be appreciated" (Gary Gray. 2001). The leg muscles work together to reduce and produce force in the most effective manner for the required activity.

**Power**

Power is the product of force, strength and velocity. Power is the ability to exert strength in a given time frame and ability to exert force quickly. A simple equation for power is: muscular strength x speed = Power (Bryant, 1988). Power is considered to be a combination of strength and speed. Power equals four times velocity and has to do with the speed of the contraction against less than maximal resistance. Power is closely related to dynamic strength, with speed or quickness of movement as the added dimension. Although strength, speed and power are related, strength alone will not develop power. Power is displayed in many activities in different ways. Dribbling the
ball, shooting the ball, throwing the ball and rebound are the examples for power needed in basketball.

**Muscular Power**

It is the ability to release maximum force as fast as possible. It is a maximum muscular contraction against a resistance in a minimum amount of time. Power = Force x Velocity. It is a compound element of motor fitness. It needs specific muscular strength, speed of limb movement and skill in integrating and co-coordinating the action. Increased velocity of parts of the body is related to improved neuromuscular initiation, co-ordination and precision of movement patterns. When a highly skilled level is attained, further performance improvement is primarily attributable to the increase in strength. Muscular power exists in its own right. Strength and power are separate entities.

**Explosive Power**

Successful sporting performance at elite levels of competition often depends heavily on the explosive leg power of the athletes involved. Many team sports also require high levels of explosive power, such as Basketball, Volleyball, Netball and the Rugby and Football codes for success at elite levels of competition. Explosive power comes from the development of speed strength and pure strength. Power represents the amount of work a muscle or muscle group can produce per unit of time (Shorten. 1991). Until recent years power as it relates to sports performance has been the subject of limited research, but in the last decade or so researchers has realized the importance of training for power in a wide variety of sporting activities (Clutch et al, 1983).
Vertical and horizontal jumping, in its many different forms, requires high levels of explosive muscular power. Brukner and Kahn (1997) note power as the equivalent of explosive strength. According to Brukner and Khan (2001), power is the equivalent of explosive strength. Young and Bilby (1993) used the term "speed-strength" synonymous with power. 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.

**Leg Explosive Power**

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.

**Cardio respiratory Endurance**

Cardio respiratory endurance refers to the ability to sustain work for prolonged periods. In football, the duration of the game is long which plays an extra demand on the cardiovascular and 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. Any activity that continuously uses large muscle groups for twenty minutes or longer, taxes these systems. Because of this, a wide variety of training methods are used to improve cardio respiratory endurance.
The kind of endurance associated with cardio-respiratory 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. The best tests to measure this facet of motor performance are long distance running and the treadmill run. The fit individual has a cardio-respiratory system which is capable of meeting the demands of the tissues under conditions of intense exercise.

Kicking

Kicking is the process of propelling the ball under the foot in the required direction at the required speed and seeing to it that it hits the target. Kicks are classified into different types according to the part of the foot with which the players are kicking the ball. There are several different ways of kicking a football. The skillful player chooses his method according to his immediate purpose, but sometimes the urgent circumstances of play predetermine the method. If the player has time, he will move often bringing the ball under his control before kicking it. The ball is brought to the ground and rolled forward slightly to the side of the body. Then it can be kicked easily and more accurately then if it were first timed immediately. But a player cannot always expect the privilege of kicking in his own time and any way of making the sure clearance or an effective pass, or of taking advantage of a very brief
opportunity of shooting. Therefore the good player must develop his skill in kicking a ball under different conditions and with either foot.

Practically any part of the surface of the foot can be employed in kicking the ball. For e.g. the low passing drives and some times for taking the goal kicks and corner kicks, inside of the foot can be used. But whatever kicks that the players may take the part of the foot, which gives more power and accuracy in the instep of the foot. The sole of the foot can be used to push a powering ball to a nearly player, the heal is used to send the ball backward. Even toe of the foot is used to prod the ball along when it is too far out of reach to do anything else. It is very much important in soccer, the placement of foot for more stability and to move any direction as required.

**Dribbling**

Dribbling is a method of advancing the ball in front or beside a player has to make in a game situation. Each player may have his own natural means of avoiding a tackle or beating an opponent. It actually means-"propelling the ball on one’s own way repeatedly touching it with either inside or outside of the one’s foot.” "The feint is the essence of dribbling. The dribbler must learn to time his feint exactly and make it looks like the real thing. His own reaction must be instantaneous; his gate away must start as soon as tackle unless he feels he has a good chance of retrieving the ball; the dribbler must appear to offer him that chance and pit the speed of his reaction against the defender's. This may develop into a 'cat and mouse' game. With the defender himself is trying to ‘catch out’ the direction by feinting to tackle. The dribbler may use the
presence of a colleague as a further decoy. Feinting to pass to him and then dashing away in another direction.

The dribbler must have complete confidence; he is playing with inches and split seconds. The process of beating a man is so complicated that the skillful dribbler does not give conscious through to its separate factors. He will have become automatic. One of the first aims when attacking is to destroy close man to man covering. A good pass and to position himself to receive one. Indeed, the clever dribbler may find the barriers against his own route to goal in surmountable and the rest test of his skills as a footballer will depend on the passes. he can distribute to better placed colleagues. The good dribbler should keep the defence gassing as to wherever he is going to pass or dribble and only if he can do both well can he make the best use of alternatives. To sum of, the dribbler must possess speed and quick reactions in his running with the ball, speed and delicacy of touch in his ball control, and the ability to dodge swerve and turn at will. He must have a sense of guile based on a knowledge of opponents, reactions to his various movements, the ability to work in a confined space; and the confidence to face upto rigorous tackling. The best way to teach a player ‘how’ to dribble is by practice (to face up to rigorous tackling) against opponent. A new dribbling technique should be practised slowly until the feet of the movement is well established. Then speed it up and practise it at different speeds. Next try to new techniques on an opponent who will ‘respond’ to the feint, and finally try it out as a variation among other methods to see if it succeeds against a new opponent, offering positive resistance that could be seen one by one.
Shooting

The aim of the game is to score goals; players need to develop both good shooting technique and a positive attitude towards taking shots whenever they have a good opportunity. If the players do not shoot, he will not score.

When shooting, one should approach the ball slightly from the side, not straight on. This allows the foot to make a more natural and effective strike on the ball. The player place the nonkicking foot at the side of the ball; swing the kicking foot backward with a bent knee; keep the eyes on the ball and head still and Swing the kicking foot forward with knee pointing down. Kicking foot follows the ball as the knee straightens.

1.5 OBJECTIVES OF THE PRESENT STUDY

The following are the objectives of the present study.

1 To compare the effects of three methods of training namely Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training and Control group on performance-related variables, selected skill performance variables and overall playing ability of inter collegiate foot ball players.

2 To study the individualized training effect of Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training, and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training on performance-related
variables, skill performance variables and overall playing ability of inter collegiate football players.

3 To identify the status of players participated at inter-collegiate level on performance-related variables, skill performance variables and overall playing ability.

1.6 HYPOTHESES

The hypotheses formulated in the present study are as follows.

1. In studying the individualized effect, it was hypothesized that Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training on Performance-related components, skill performance and overall playing ability will have a significant improvement from baseline to post treatment on all the selected variables for this study.

2. It was hypothesized that there may be significant differences among the three methods of training namely Periodization based Resistance Training, Speed-based Resistance Training cum Plyometric Training and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training and Control group on selected Performance-related component, skill performance variables and overall playing ability of inter collegiate football players.

3. It was hypothesized that combination of Periodized Resistance Training and Speed-based Resistance training cum Plyometric
Training may be expected to provide a superior training stimulus for developing selected skill performance variables and performance-related variables of football players and overall all playing ability than Periodized Resistance cum Plyometric Training and Speed-based Resistance Training cum Plyometric Training.

4. It was further hypothesized that Periodized Resistance Training cum Plyometric Training and Speed-based Resistance Training cum Plyometric Training may produce similar effects in developing the performance-related variables, selected skill performance variables and over all playing ability of inter collegiate football players.

5. It was hypothesized that interventions used in the present study of Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training will have significant development on criterion variables as compared to Control group.

1.7 SIGNIFICANCE OF THE STUDY

The present study is significant in the following aspects.

1. The salient feature of the applications of various training modules used in the present study towards the development of skill performance and performance-related variables are specifically underlie with peroidiztion. Generally periodization based training modules accommodate all types of muscles during the course of
training alternatively with slow and high intensity. It helps the players have the uniqueness in musculature and uniform development in the skill performance and performance-related components.

2. The interventions such as Periodized Resistance cum Plyometric Training, Speed-based Resistance cum Plyometric Training and Combination of Periodized Resistance and Speed-based Resistance cum Plyometric Training used in the present study are a scientifically structured one. Hence it is believed that players treated with these training programmes can be benefited in time with regard to the development of skill performance of kicking, dribbling, heading, throwing and overall playing ability and performance-related variables of football players.

3. The present study would provide a scientific base and guidance to the physical educationists, coaches, sports scientists, exercise physiologists and fitness leaders to design the combined training programme using the training modules in the present study with the view to develop variables related to physical fitness and skill performance.

4. One of the basic objectives of the present study is to extract the full potentials from the players with the feasible means and methods. Having the usage of full potentials, low achievers can be easily made as high achievers. It helps them play matches that are at par competition successfully.
5. Finding of this research study would give a basic knowledge to the trainers and fitness leaders to envisage and conduct further research in various training methods, training programmes, training intensity and training load to enhance the performance of football players.

6. Generally there is a chance to occur injuries for players during the course of training itself, since the given training is a progressive nature with rest. But in the case of effect of periodized based training, the mode of training is alternative form of slow and high in intensity. The period of slow form of training provides both recovery and maintains the resultant effect. Such an astonishing nature of periodized based training helps reduce the rate of incidence in the occurrence of injuries during the course of training. By this, the players can be benefited to continually participate in the training instead of dropping out from the training due to injury.

7. The result of this study would add to the quantum of knowledge in the areas of training methods, fitness and wellness, exercise physiology and exercise science.

8. The periodical evaluation of players on criterion measures helps the players know their level of progress over the period of time. It helps them motivate themselves to actively participate in the training program.

9. Further the results on periodical evaluation on criterion measures helps the physical trainers and coaches find out the status of players at varied intervals.
1.8 DELIMITATIONS

The delimitations of the study are as follows.

1. Subjects of the present study were delimited to the football players who were the participants of Bharathiar University inter-collegiate tournaments.

2. The total number of subjects was delimited to eighty and each group was consisting of twenty football players.

3. As far as performance-related variables concerned it was delimited to arm strength, leg strength, arm explosive power, leg explosive power, speed and cardio respiratory endurance.

4. As far as skill performance variables concerned it was delimited to kicking, dribbling, shooting and overall playing ability.

5. In measuring the overall playing ability of football players concerned, it was delimited to the method of expert rating using ten point rating scale.

6. In measuring the skill performance variables of kicking, dribbling and shooting ability, it was delimited to AAHPERD test and Mor S. and Christian, V (1979) test which was a standardized one.

7. The period of training programme was delimited to twelve weeks.
1.9 LIMITATIONS

The limitations of the present study are as follows:

1. The influence of certain factors like life style daily routine work, diet and other factors on the results of the study were not taken into consideration.

2. No attempt has been made to control the factors like air resistance, intensity of light atmosphere and temperature during training and testing period.

3. The difference in economic and educational background of the football players was not taken into consideration.

4. The knowledge of the subjects in exercise science and their previous experience in doing physical activities were not taken into consideration.

5. Since the subjects were motivated verbally during testing and training periods no attempt was put to differentiate their level of motivation.

6. The psychological stress and other factors, which affect the metabolic function were not taken into consideration.

7. The heredity of the subjects and its influence on the selected variables were not taken into consideration.
1.10 DEFINITION OF TERMS

**Speed**

Speed is defined as “the ability to move the entire body rapidly from one place to another” Johnson (1971).

**Strength**

Mathews has defined muscular strength as the force that a muscle or groups of muscles can exert against a resistance in one maximum effort.

**Cardio-vascular Endurance**

Clarke defines the cardio-vascular endurance as the moderate contractions of large muscle group for relatively longer periods of time, during which maximum adjustment of the cardio-respiratory systems are necessary.

**Power**

Power has been defined as the product of force (or torque) and velocity, i.e., rate of doing work (Thomas et al 1997).

**Training**

**Resistance training**

According to the American Sports Medicine Institute resistance training is a “specialized method of conditioning designed to increase muscle strength, muscle endurance, and muscle power”.

**Periodization Training**

Periodized strength training refers to varying the training program at regular time intervals in an attempt to bring about optimal gains in strength, power and motor performance (Fleck, 1999).

**Speed-based resistance Training**

Sprint training performed with some resistance training at a fast speed produced strength gains at all speeds, whereas training at a slow speed produced strength gains only at slow speeds. The fast resistance training movements with low repetitions, performed for multiple sets, are necessary to produce optimal increases in muscle strength or power.

**Plyometric Training**

Plyometrics by definition is, a type of exercise using explosive movements to develop muscular power, esp. bounding, hopping and jumping. This may also defined as ‘Shock method training’ which is the term now applied to exercise that have their roots in Russia, where they first known simply as jump training drills. The actual term “Ploometrics” was first coined in 1975 by Fred Wilt, an American and a more forward thinking track and field coaches.
Kicking

Kicking is the process of propelling the ball under the foot in the required direction at the required speed and seeing to it that it hits the target.

Dribbling

Dribbling is the process of propelling the ball on one's own way repeatedly touching it with either inside or outside of the one's foot.

Shooting

Shooting can be derived as “sending the ball towards the exact target with a reasonable speed by shooting” Reabun Forst (1997).