CHAPTER 1

INTRODUCTION

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INTRODUCTION

Sports in the present world has become extremely competitive. It is not the mere participation or practice that brings out victory to an individual. Therefore, sports life is affected by various factors like physiology, biomechanics, sports training, sports medicine, sociology and psychology etcetera. All the coaches, trainers, physical educational personals and doctors are doing their best to improve the performance of the players of their country. Athletes of all the countries are also trying hard to bring laurels, medals for their countries in International competitions.

Athletic performance has dramatically progressed over the past few years. Performance levels unimaginable before are now common place, and the number of athletes capable of outstanding results is increasing. One factor is that athletics is a challenging field, and intense motivation has encouraged long, hard hours of work. Also, coaching has become more sophisticated, partially from the assistance of sport specialists and scientists. A broader base of knowledge about athletes now exists, which is reflected in training methodology (Bompa, 1999).

Most scientific knowledge, whether from experience or research, aims to understand and improve the effects of exercise on the body. Exercise is now the

focus of sport science. Research from several sciences enriches the theory and methodology of training, which has become a branch of science.

1.1 SPORTS

Sport is an activity that is governed by a set of rules or customs and often engaged in competitively. Sports commonly refer to activities where the physical capabilities of the competitor are the sole or primary determinant of the outcome (winning or losing), and motor sports where mental acuity or equipment quality are major factors. Sport is commonly defined as an organized, competitive and skillful physical activity requiring commitment and fair play. Some view sports as differing from games based on the fact that there are usually higher levels of organization and profit involved in sports. Accurate records are kept and updated for most sports at the highest levels, while failures and accomplishments are widely announced in sport news.

The term sports is sometimes extended to encompass all competitive activities in which offense and defense are played, regardless of the level of physical activity. Both games of skill and motor sport exhibit many of the characteristics of physical sports, such as skill, sportsmanship, and at the highest levels, even professional sponsorship associated with physical sports.

Sports that are subjectively judged are distinct from other judged activities such as beauty pageants and bodybuilding shows, because in the former

the activity performed is the primary focus of evaluation, rather than the physical attributes of the contestant as in the latter.

1.2 FOOTBALL

Football, more commonly known as association football or Soccer, is a team sport played between two teams of eleven players using a spherical ball. Association football is the most popular football variant worldwide, and is widely considered to be the most popular sport in the world.

The game is played on a rectangular grass or artificial turf field, with a goal in the centre of each of the short ends. The object of the game is to score by driving the ball into the opposing goal. In general play, the goalkeepers are the only players allowed to use their hands or arms to propel the ball; the rest of the team usually use their feet to kick the ball into position, occasionally using their torso or head to intercept a ball in midair. The team that scores the most goals by the end of the match wins. If the score is tied at the end of the game, either a draw is declared or the game goes into extra time and/or a penalty shootout, depending on the format of the competition.

The modern game was codified in England following the formation of The Football Association, whose 1863 Laws of the Game created the foundations for the way the sport is played today. Football is governed internationally by the Federation Internationale de Football Association (International Federation of

Association Football), commonly known by the acronym FIFA. The most prestigious international football competition is the FIFA World Cup, held every four years. This event, the most widely viewed in the world, boasts an audience twice that of the Summer Olympic Games. (Marples, M,1954)

In typical game play, players attempt to create goal scoring opportunities 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 in possession of the ball; however, physical contact between opponents is restricted. Football is generally a free-flowing game, with play stopping only when the ball has left the field of play or when play is stopped by the referee. After a stoppage, play recommences with a specified restart.

The Laws of the Game do not specify any player positions other than goalkeeper, but a number of specialised roles have evolved. Broadly, these include three main categories: strikers, or forwards, whose main task is to score goals; defenders, who specialise in preventing their opponents from scoring; and midfielders, who dispossess the opposition and keep possession of the ball in order to pass it to the forwards in their team. Players in these positions are referred to as outfield players, in order to discern them from the single goalkeeper. These positions are further subdivided according to the area of the

field in which the player spends most time. For example, there are central defenders, and left and right midfielders. The ten outfield players may be arranged in any combination. The number of players in each position determines the style of the team's play; more forwards and fewer defenders creates a more aggressive and offensive-minded game, while the reverse creates a slower, more defensive style of play. While players typically spend most of the game in a specific position, there are few restrictions on player movement, and players can switch positions at any time. The layout of a team players is known as a formation. Defining the team's formation and tactics is usually the prerogative of the team's manager. (Gardiner, 2002)

A standard adult football match consists of two periods of 45 minutes each, known as halves. Each half runs continuously, meaning that the clock is not stopped when the ball is out of play. There is usually a 15-minute half-time break between halves. The end of the match is known as full-time.

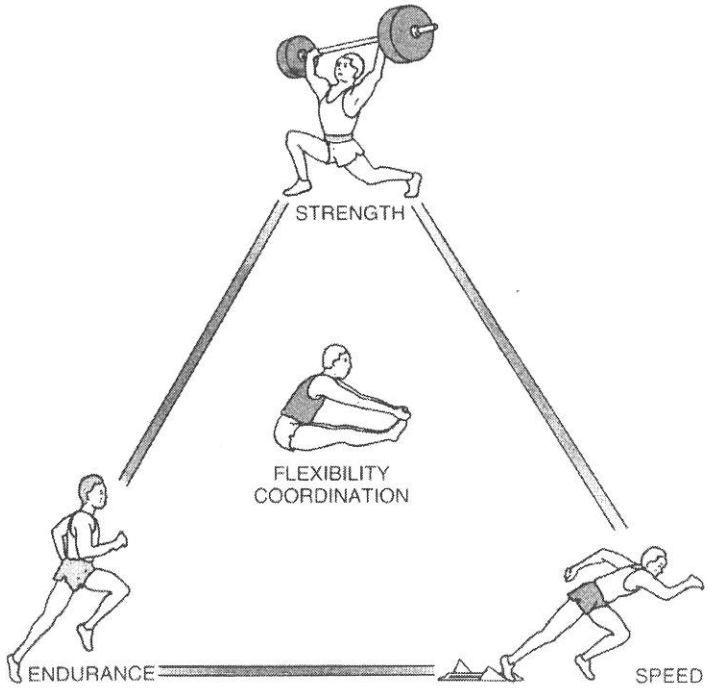
Today, football is played at a professional level all over the world. Millions of people regularly go to football stadiums to follow their favorite teams, while billions more watch the game on television. A very large number of people also play football at an amateur level. According to a survey conducted by FIFA published in 2001, over 240 million people from more than 200 countries regularly play football. Its simple rules and minimal equipment requirements have no doubt aided its spread and growth in popularity.

1.3 BIOMOTOR ABILITIES

Fitness has been defined as how well a person is adapted to and capable of living a certain lifestyle. The athlete obviously has greater fitness than the non-athlete because of the training for a chosen event or events. But what is fitness made up from? The law of specificity states that there is a specific response to the specific nature of a training load. This specific response will tend to emphasise one or more of the abilities that make up fitness. These abilities are basic and respond well to training. Since these abilities affect how the body moves they are given the name "biomotor abilities".(IAAF, 2002)

1.3.1 THE COMPONENTS OF BIOMOTOR ABILITIES

There are five basic biomotor abilities and these are strength, endurance, speed, flexibility and coordination.



Relationship of the biomotor abilities

Each exercise in training tends to develop a particular biomotor ability. For example, when the load of an exercise is maximal it is a strength exercise. Quickness and frequency of movement give a speed exercise. If distance or duration is maximal the exercise becomes endurance based.

Exercises that have relatively complex movements are called coordination exercises. This is a simplified view and practice exercises usually develop two or more biomotor abilities.

Different events have different demands on fitness. The fitness of the marathon runner is obviously very different to the fitness of the shot putter. To

develop the specific fitness required for an event it is necessary for the coach to understand the characteristics of the five biomotor abilities and how to develop them.

1.3.2 STRENGTH

Muscular strength is the ability of the body to exert force. Strength is important to every event for both men and women. Muscle fibres within the muscles respond when subjected to weight or resistance training. This response makes the muscle more efficient and able to respond better to the central nervous system. Strength may be broken down into three types:

- Maximum strength
- Elastic strength
- Strength endurance

1.3.3 MAXIMUM STRENGTH

This is the greatest force that a contracting muscle can produce. Maximum strength does not determine how fast a movement is made or how long the movement can be continued. It is important in events where a large resistance needs to be overcome or controlled.

1.3.4 ELASTIC STRENGTH

Elastic strength is the type of strength required so that a muscle can move quickly against a resistance. This combination of speed of contraction and speed of movement is sometimes referred to as "power". This special type of strength is of great importance to the "explosive" events in running, jumping and throwing.

1.3.5 STRENGTH ENDURANCE

This is the ability of the muscles to continue to exert force in the face of increasing fatigue. Strength endurance is simply the combination of strength and duration of movement. Performing an exercise, such as sit-ups, to exhaustion would be a test of strength endurance. This strength characteristic determines an athlete's performance where a movement is repeated over a fairly long period of time. Runs between 60 seconds and 8 minutes, for example, require a lot of strength endurance.

1.3.6 DEVELOPMENT OF STRENGTH

Weight training and resistance training develop strength. If there is an increase in muscle mass as a result of training this is called hypertrophy. Muscle hypertrophy is associated more as a result of training for maximal and elastic strength rather than strength endurance. When strength training stops the law of reversibility indicates that some strength will be lost and the muscle mass may

reduce. Reduction in the muscle mass is known as atrophy. Muscle atrophy is a direct result of low, or no, activity and may be a factor in injury rehabilitation.

Maximum strength is best developed by exercises which involve a low number of repetitions and a large resistance or loading. Elastic strength is developed through fast repetitions using a medium loading and strength endurance is developed using a high number of repetitions with a low resistance.

1.3.7 ENDURANCE

Endurance refers to the ability to perform work of a given intensity over a time period, and is sometimes called endurance. The main factor which limits and at the same time affects performance is fatigue. An athlete is considered to have good endurance when the athlete does not easily fatigue, or can continue to perform in a state of fatigue. Endurance, of all the biomotor abilities, should be developed first. Without endurance it is difficult to repeat other types of training enough to develop the other components of fitness. There are two basic types of endurance:

- Aerobic endurance
- Anaerobic endurance

1.3.8 AEROBIC ENDURANCE

Aerobic means "with oxygen" and aerobic endurance means muscular work and movement done using oxygen to release energy from the muscle fuels. The absorption and transport of the oxygen to the muscles is carried out by the cardio-respiratory system. Aerobic training leads to both a strong cardio-respiratory system and an increased ability to use oxygen in the muscles. Aerobic endurance can be developed by continuous or interval running. The longer the duration of an event the more important is aerobic endurance. Aerobic endurance should be developed before anaerobic endurance.(IAAF, 2002)

1.3.9 ANAEROBIC ENDURANCE

Anaerobic means "without oxygen" and anaerobic endurance refers to the energy systems which allow muscles to operate using energy they already have in store. Anaerobic training allows the athlete to tolerate the build up of lactic acid. There are two important types of anaerobic endurance, speed endurance and strength endurance. Developing speed endurance helps an athlete to run at speed despite the build up of lactic acid. Strength endurance allows the athlete to continue to express force despite the lactic acid build up.

1.3.10 DEVELOPMENT OF ENDURANCE

Both aerobic and anaerobic endurance can be developed using interval training. The variables in interval training are:

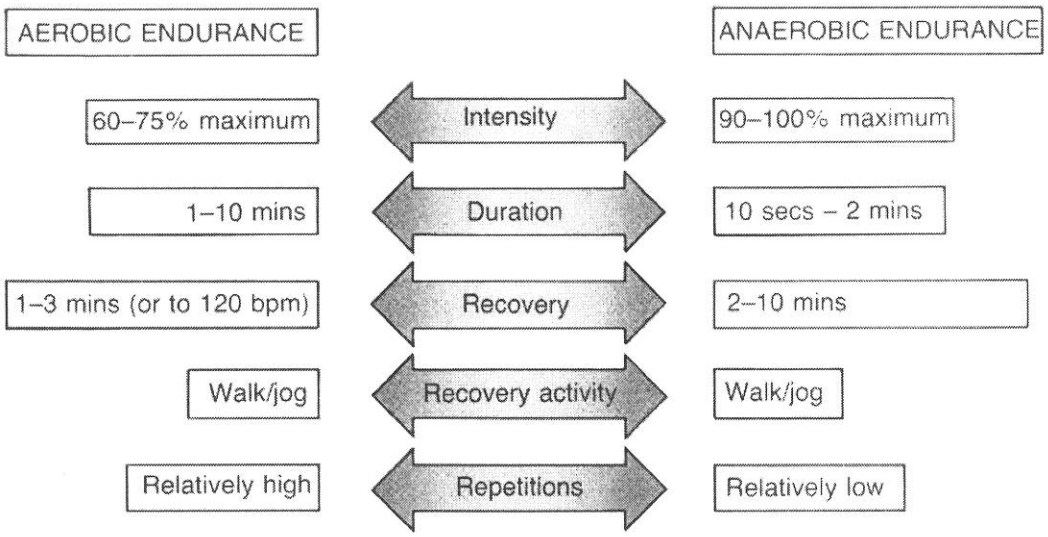
Intensity Speed or velocity of the repetitions. This may be expressed as a percentage of maximal speed or effort.

Duration Length of time or distance of one repetition.

Recovery Time of intervals between repetitions and sets.

Recovery activity Normally a low intensity movement such as a walk or jog.

Repetitions The total number of repetitions in a session. These may be divided into sets.



Comparison of interval training for aerobic and anaerobic endurance

1.3.11 SPEED

Speed is the capacity to travel or move very quickly. Like all biomotor abilities speed can be broken down into different types. It may mean the whole body moving at maximal running speed, as in the sprinter. It may involve optimal speed, such as the controlled speed in the approach run of the jumping events. or, it may include the speed of a limb, such as the throwing arm in the shot or discus, or the take-off leg in the jumps.(IAAF, 2002)

1.3.12 DEVELOPMENT OF SPEED

Speed training involves development of a skill so that the technique is performed at a faster rate. To develop speed the skill must be practised on a

regular basis at a maximum or close to maximum rate of movement. Maximal running speed, for example, is developed by runs over short distances at maximum effort. The skill of moving at speed should, like all skills, be practised before the athlete becomes fatigued. For this reason recovery times between repetitions and sets should be long enough to recover from any fatigue.

When considering speed it is important to include reaction time. Reaction time is the time between a stimulus and the first movement by the athlete, such as the firing of the starter's pistol and the athlete's movement from the blocks. There are many factors both physiological and psychological which influence reaction time and the initiation of movement. Reaction time can be improved with practice, provided the practice situation is realistic.

1.3.13 FLEXIBILITY

Flexibility is the ability to perform joint actions through a wide range of motion. The natural range of motion of each joint in the body depends on the arrangement of tendons, ligaments, connective tissue and muscles. The limit to a joint's range of motion is called the "end position". Injuries can occur when a limb or muscle is forced beyond its normal limits. Flexibility training can help reduce the risk of injury by gradually increasing a joint's range of motion.

Restricted flexibility is one of the common causes of poor technique and performance. Poor flexibility also hinders speed and endurance since the muscles

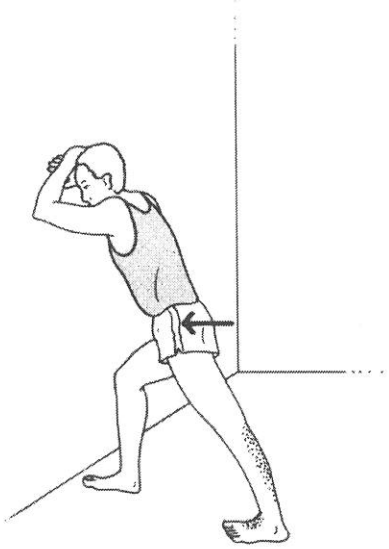
have to work harder to overcome the resistance to an efficient stride length. Flexibility tends to decrease as we get older, while females are usually more flexible at all ages. The ideal is to start young athletes on regular stretching programmes to prevent the loss of flexibility that comes with age.

1.3.14 DEVELOPMENT OF FLEXIBILITY

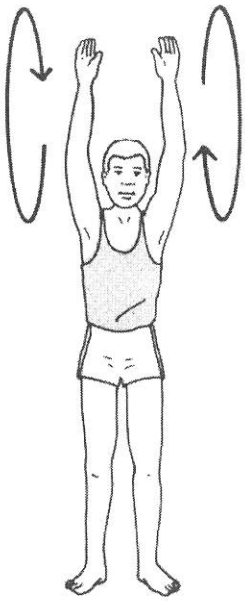
Improving flexibility, like the development of other fitness abilities, is a slow process. To increase the range of motion of a joint the muscles have to be stretched beyond their normal point of resistance. This should be done daily with appropriate flexibility exercises. There are two main types of stretching exercise:

- Active stretching
- Passive stretching

In active stretching the athlete controls the movement. These exercises are either done in the end position, a static exercise or by moving through the full range of motion, a dynamic exercise.



An active static exercise



An active dynamic exercise

In passive stretching the exercises are only performed in the end position, the static type of exercise, a partner controls the movement and great care is required. The athlete actively goes to the end position and the partner progressively applies pressure. At this point the athlete should concentrate on relaxing the muscles being stretched. Passive static stretching exercises can produce good improvements in range of motion. (IAAF, 2002)

A passive static exercise

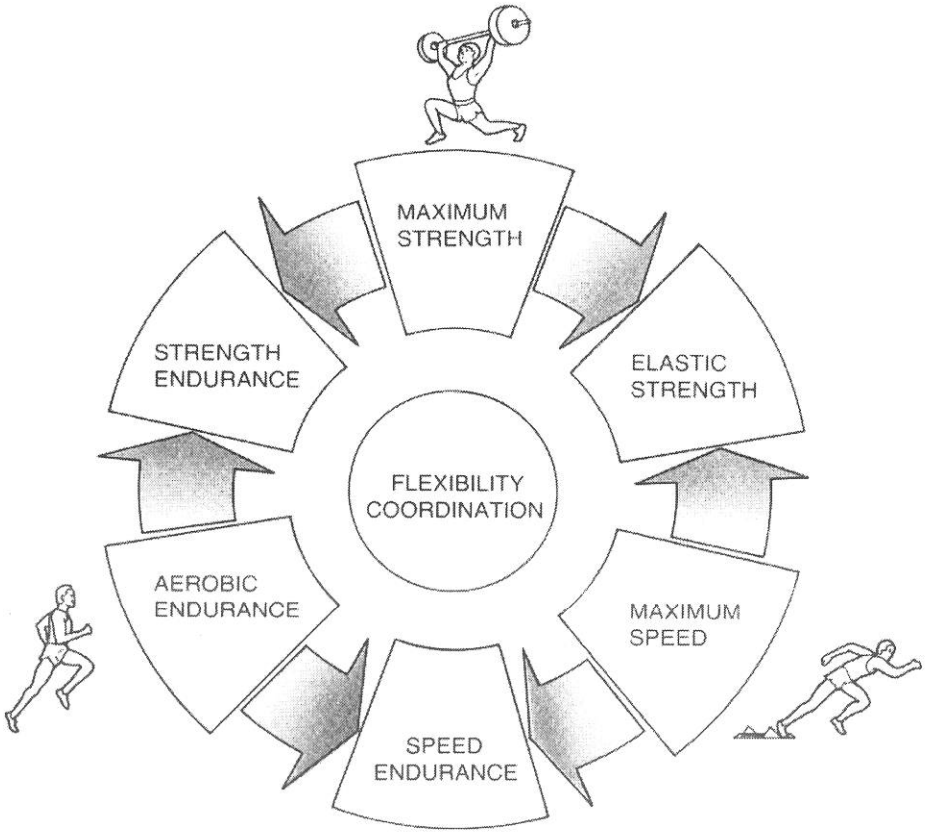
1.3.15 COORDINATION

Coordination is the ability to perform movements of various degrees of difficulty very quickly and with efficiency and accuracy. It is considered that an athlete with good coordination is capable not only of performing a skill well, but also of rapidly solving a training task.

1.13.16 DEVELOPMENT OF COORDINATION

The coordination required for running, jumping and throwing can be developed from young age. Girls between the ages of 8 and 11 and boys between the ages of 8 and 13 have exceptional rates of learning. Basic coordination exercises that are learned at this age become the foundation for later event specific skill development. In the mature athlete coordination exercises and drills

remain important as they maintain a balance against the imbalances caused by very specific training.



Inter-relationship of the biomotor abilities

The biomotor abilities have been presented separately to identify the characteristics of each. In practice there is no such thing as a "pure" strength exercise or a "pure" speed exercise. The biomotor abilities are components of overall physical fitness and an understanding of their inter- relationship allows the coach to plan training more effectively. (IAAF, 2002)

1.4 SPORTS TRAINING

Training is a programme of exercise designed to improve the skills and to increase the energy capacity of an athlete for a particular event, therefore training is essential for the development of physical fitness components (William and Sperryn, 1976).

Sports training is the process of sports protection based on scientific and pedagogical principles for higher performance (Hardayal Singh, 1991).

The Basic training procedures serve better when utilized with modification suited to individuals or a group dealt with. The training programme should look into improving the performance of the athletes and at the same time should prevent injury from taking place (Fox, 1984).

Training means a systematic scientific programme of conditioning exercise and physical activities designed to improve the physical fitness and skills of the players or athletics participated. Training means preparing for something for an event or reason of athletic competition, a nursing carrier or operative performance of military combat, much growth and change occur during training.

Training involves periodic assessment of the athlete's status and progress. Training usually varies regular increase in the difficulty of task performance. Training suggests some form of gradual increase in performance output over an

extended period of time. Most kind of training needs regular repeated and collective repetition of some of the original movement. Any invariable training implies hard work. Training should result in a level of personal fitness and should be associated with good health.

1.5 CIRCUIT TRAINING

Circuit training is very special form of training which concentrates on different parts of the body and general endurance. Circuit training is a method of physical conditioning that employs both resistance training and callisthenic training exercises. The method was originally introduced by Morgan and Adamson in the late 1950s at the university of Leads, England. The intensity and vigor of circuit training are indeed challenging and enjoyable to the performer. This system produces positive changes in future in motor performance. General fitness, muscular power, endurance and speed have shown decided improvement as well.

Circuit training is based on the premise that the athlete must do the same amount of work within the limits of an assigned training period. Numerous variations of this system are in use, but all employ certain common factors: a circular arrangement of the activities that permits progression from one station to another until all stations have been visited, the total comprising a "circuit" and a limiting time within which the circuit must be concluded.

Circuit training employs a series of exercises stations that consists of weight training, flexibility, calisthenics, and brief aerobic exercises. In circuit training the subjects can move rapidly from one station to the next and perform whatever exercise is to be done at that station within a specified time period. A circuit would consist of 8 to 12 stations and the entire would be repeated within three of four times, concentrating on the legs, abdomen, back, arms, shoulders and trunk. These exercises should be organized so that the subject moves from one muscle group to another. This method allows working hard on a muscle group and then resting it, while the other groups have their own work out (Tancred, 1987).

The advantages of circuit training are:

- "Circuit Training is an ideal workout on one training day during peak season which envelopes aerobics, anaerobic, strength and jumping agility in a single package. Several trainees can participate in a chain.

- The circuit work will increase the general work capacity by improving the ability to tolerate increasing levels of muscular fatigue (stamina improvement).

- The circuit training will have shorter exercise and shorter rest intervals between exercises, thus maintaining elevated heart rates during the circuit workouts and helping to upgrade the cardiorespiratory capacity.

- Circuit efforts will enhance the overall body strength.
- The circuits will improve the movement skill and body awareness,
- The circuit programme will increase the lean muscle mass by a moderate amount and decrease the body- fat levels through high levels of energy expenditure (body composition improvement)."

Easy to work every muscle in the body can be adapted for any size workout area does not require expensive gym equipment can be customised for specificity, easy to adapt to the sport. Circuit training is an efficient and challenging form of conditioning. It works well for developing strength, endurance, flexibility and co-ordination. One of the best types of training for improving strength endurance – be it for a sport such as soccer or triathlon.

1.6 MEDICINE BALL TRAINING

The medicine ball has been used as an athletic training aid for decades in Europe, in recent years the value of medicine ball training has been recognised in the United States. A number of collegiate and professional sports teams are now incorporating this form of strength development into their training, and with proper guidance runners can also benefit from using the medicine ball.

The medicine-ball workouts involve lifting, throwing, and catching the ball, in real focal point surrounds the junction between the trunk and the legs. This meeting point, also called the 'core' area of the body, is coordinated and held together to the abdominal, spinal erector, hip flexor, and gluteal ('buttock') muscles. This central region is also called the 'power zone' of the body, the force 'moves' through this area from one leg to the other during the act of running, the core muscles must stabilise the body during footstrike so that unnecessary motions are minimised and all the power created to the hip and leg muscles can be used to drive the body straight forward.

The direct flexion and extension, there is much more rotational action in the trunk during running. Medicine ball training, however, can give the additional specific strength, can be used directly during the workouts and races to improve the running velocity and overall power."

The ability to generate strength and power is a very important component for success in many sports. The Medicine ball exercises can also be used as part of a plyometric training programme to develop explosive movements.

Recently many new products have helped add variety to training and rehabilitation. The Medicine ball is an older product that has made its way back into favor. The balls also are a great tool for improving dynamic flexibility.

1.7 INTENSITY OF TRAINING

Intensity has been called the most important of the prescriptive components. It is also the most difficult because of the necessity of bringing in control. That is, intensity is expressed in terms that they are stable such as heart rate, so attention must be made to conditions that create stability and the methods of monitoring change.

The intensity and length of the work interval should be based upon the primary energy system being used in the activity. Sprinters should have short high intensity intervals whereas marathons may run intervals of 3 miles at race pace or slower. It should be pointed out that the rest interval is really not a time to stop all activities but only a jog or walk period which allows the body to recover somewhat before the next interval begin.

1.8 PROGRESSIVE INTENSITIES OF TRAINING

Better performances can be the product of a number of factors. This product is primarily the outcome of efficient technique, the progression of speed and the maturing competitive attitude on a sound basis of general endurance, all round strength and general mobility.

The development of all round strength is best achieved progressing this through intensities of training. In this method the overload is constantly increased

to facilitate adaptation. Progressive intensity is essential for building muscle and reaching goals of all round fitness.

One of the major goals of an exercise program is to make it not only intense enough to see some positive results (in terms of cardio respiratory endurance) but also to make it enjoyable enough to where it becomes a part of an individual's regular routine, any person should look forward to workout session and not dread it. It is better to start gradually and take more time reaching the objectives than to start at a high level and drop out because of injury caused by either the intensity or frequency of the programme. Any sports activity, whether it is running, calisthenics can be done in accordance with the interval principle. As a matter of fat man should do all physical work in intervals rather than continuously more work and less fatigue will be the reward.

1.9 OBJECTIVES OF THE STUDY

Football training and football coaching need to be helping to target the right muscles for fitness. Football is a sport that requires a multitude of athletic abilities, such as explosive acceleration and fast sprinting speed; muscular endurance and strength in the lower body; muscular balance and high levels of neuromuscular co-ordination, body awareness and agility, the ability to know where the body is, and be able to move it; good flexibility to avoid injury and correct balance between the quadriceps and hamstrings, as well as strength

imbalances between the left and right leg. Thus, every footballer is interested to improve their biomotor abilities, strength, endurance, speed, flexibility and coordination.

Coaching and training for young athletes' is very interesting but at the same time it must be based on some standard procedures and specific scientific principles should be followed. There are different types of training methods for the development of biomotor abilities of athletes. Understanding these training methods and the effectiveness of the training methods to suit a particular game and game situations is a challenging task for any coach or player. This helps coaches and athletes prevent injury and overtraining while trying to maximize their physical ability, and analyze the strengths and weaknesses related to their specific training programs. If one failed to establish correct training patterns for young athletes, unfortunately, goes way back. Hence the investigator was interested to find out the effects of structured circuit training and progressive intensity medicine ball exercises on the biomotor abilities of college men footballers.

Thus, the objective of this research is to assess the biomotor abilities, namely, speed, agility, flexibility, endurance, explosive power and muscular strength of the college men football players. The effect of structured circuit training and progressive intensity medicine ball exercises on each of these biomotor abilities and to compare these effects with control group to determine

whether these training produce significant changes in the biomotor abilities. If so, which of the training method is better than the other one? Thus, the current research focuses on the effects of structured circuit training and progressive intensity medicine ball exercises on selected biomotor abilities of college men football players.

1.10 STATEMENT OF THE PROBLEM

This experimental study was to find out the effects of structured circuit training and progressive intensity medicine ball training on selected biomotor abilities among college men football players.

1.11 HYPOTHESIS

In light of the preceding discussion and for the purpose of the present investigation:

1. It was hypothesized that there would be significant effects due to structured circuit training on selected biomotor abilities, namely, speed, agility, flexibility, endurance, explosive power and muscular strength of the college men football players compared to control group.

2. It was hypothesized that there would be significant effects due to progressive intensity medicine ball training on selected biomotor abilities, namely, speed,

agility, flexibility, endurance, explosive power and muscular strength of the college men football players compared to control group.

3. It was further hypothesized that compared between structured circuit training and progressive intensity medicine ball training, structured circuit training would be significantly better than progressive intensity medicine ball training in altering the selected biomotor abilities.

1.12 SIGNIFICANCE OF THE STUDY

The present investigation will contribute significantly to the field of physical education and sports in the following ways.

1. This study may help the Coaches and Physical Educators to train the athletes to improve their biomotor abilities.

2. This research may help the sports scientists to suggest ways and means to improve better standard in sports through suggesting suitable training methods.

3. The results of this study will give a clear picture to the sports coaches that which are all the specific exercises to be included in the training schedule for the improvement of specific biomotor abilities of the football players.

4. This study will provide an opportunity to test football players in the possible biomotor abilities.

5. This study will give a clear conception to the researcher, whether the structured circuit training or progressive intensity medicine ball training influences selected biomotor abilities.

6. The findings of this research would pave further ways and means to explore similar researches on framing suitable training methods for the improvement of players.

7. This study stimulates the players' interest in activities through self evaluation of the performance they do and the importance they show.

8. This study may provide clear guidelines in better performance to be groomed for higher levels of competition.

1.13 LIMITATION

Uncontrollable factors associated with the study were accepted as limitation and the following were considered as limitation of the research study:

1. Certain factors like rational habits like life style, daily routine, diet and climatic conditions were not taken into account in the study.

2. The influence of vigorous academic activity of students could have discouraged or motivated the subjects during training and during testing period.

3. The heterogeneous characters of the subjects in hereditary and environmental factors were recognized as a limitations.

4. The subject's body type and socio economic status of the students were not taken into consideration.

5. Uncontrollable changes in climate and weather conditions such as atmosphere, temperature, humidity and other meteorological factors during the training programme were regarded as limitations.

1.14 DELIMITATION

The following delimitations were taken into consideration during this study:

1. Only first year Football male students of Indian Institute of Technology Madras were selected as subjects for this study.

2. The age of the subjects selected for the study was between 19 to 21 years and the proficiency of the College men foot ball players was assumed only by the level of participation.

3. All the subjects were residents in the same hostel and hence the nutritional status and day to day activities of all the subjects were similar.

4. The number of groups for the study was delimited to three with thirty subjects in each group considered as adequate to draw meaningful conclusions.

5. The training was confined to the circuit training eight exercises and medicine ball training eight exercises was performed.

6. The duration of the experimental period was limited to 12 weeks and the training was conducted thrice a week.

7. To test the hypothesis the following parameters were analysed.

Dependent Variables

1. Speed,
2. Agility,
3. Flexibility,
4. Endurance,
5. Explosive power
6. Muscular strength

Independent Variables

1. Twelve weeks structured circuit training
2. Twelve weeks progressive intensity medicine ball training

1.15 DEFINITION OF TERMS

1.15.1 Training

Training has been explained as programme of exercise designed to improve the skills and increase the capacities as resting heart rate (Hardayal Singh, 1991).

1.15.2 Speed

The capacity of moving a limb or part of the body's lower system or the whole body with the greatest possible velocity (Frank Dick, 1992).

The maximal rate at which an individual is able to move the entire body over a specific distance is considered to be his speed movement (Eckert, 1974).

1.15.3 Strength

Strength is defined as a force that a muscle or group of muscles can exert against resistance in one's maximum effort.

It is the ability to overcome resistance or to act against resistance. (Hardayal Singh, 1991).

1.15.4 Leg Explosive Power

It is the capacity of the muscles to release maximum force in the shortest period of time.

Power is one of the most basic components of movements. Leg explosive power is the capacity of the individual to bring into play maximum muscle contraction at the fastest rate of speed of the legs. (Hardayal Singh, 1991).

1.15.5 Agility

Agility may be defined as the physical ability which enables an individual to rapidly change body position and direction in a precise manner.

It is the ability of the body or parts of the body to change direction rapidly and accurately (Barrow and Mc Gee, 1979).

1.15.6 Flexibility

Flexibility is the range of motion around a joint. Good flexibility in the joints can help prevent injuries through all stages of life (Hardayal Singh, 1991).

1.15.7 Muscular Endurance

Muscular endurance is the ability of the muscle to continue to perform without fatigue. (Mathews, 1981)

1.15.8 Cardiorespiratory Endurance

Cardio respiratory endurance is the ability of the body's circulatory and respiratory systems to supply fuel during sustained physical activity. (Guyton. 1979)

1.15.9 Muscular Strength

Muscular strength is the ability of the muscle to exert force during an activity. The key to make the muscles stronger is working them against resistance, whether that is from weights or gravity. (Mathews, 1981)

1.15.10 Circuit Training

It is the type of training, in which a certain number of exercise are done one after the other in the form of a circuit. This circuit is repeated three or more times. Circuit training can be used for the improvement of technical and tactical element or for the improvement of conditional activities (Hardayal Singh, 1991).

1.15.11 Medicine Ball

A leather ball of approximately eighty five centimeters circumference stuffed with rugs or cotton weighing three and four kilograms.

1.15.12 Medicine Ball Training

Performing exercises with medicine ball for the development of the strength, flexibility, endurance and speed is considered medicine ball training.

1.15.13 Intensity

Intensity is the rate of doing work. In other words it is the pace of which a physical activity is done.

Intensity is the impact of the load at every movement of the exercise with a degree of concentration of the volume of training work in time.(Hardayal Singh, 1984)