

CHAPTER I

INTRODUCTION

Human beings are competitive and ambitious in general nature not only in day to day activity, but in leisure time too. Though the leisure time activity was started to recreate from the routine, it has become popular and challenging task among the people nowadays. This leisure time activity called sport has become extremely competitive. It is not mere participation in sports but to become victories. Naturally the participants were exposed to think of ways and means to get victory. In the past few years, athletic performance has improved considerably. The number of athletes who are able to get prominent results has increased (Boumpa, 2010), the predominant factors like physiology, biomechanics, and different sports training methods, sports medicine, sociology, computer application and sports psychology helped the stakeholders to get success in their participation. However, in the 21st century, it is difficult to break Sports records unless novel exercises replace the previous methods. Therefore, conducting research according to facts and findings is very significant one (Shahdadi, 1999). Basketball is no exception with regard to above facts. To master over the fundamental skills it needs to have systemic planning and training. According to Dr.James Naismith "The invention of basketball was not an accident. It was developed to meet a need." So it is essential to look on the physical fitness components.

1.1 PHYSICAL FITNESS

Physical fitness is not one of the most important keys to a healthy body; it is the basis of dynamic and creative intellectual activity (J.F. Kennedy) Physical fitness is the ability of the human body to cope with the environment over a longer period of time under sustained pressure. To play Basketball and to be a successful player one needs good speed, agility, body composition, muscle strength, muscular endurance, power, agility, flexibility, balance, coordination, and cardiovascular endurance, these factors which are considered most important. To enhance the required fitness components it needs to stress them by means of different sports trainings. In simple terms one can say that a person has to be physically fit to participate in any sport.

1.2 SPORTS TRAINING

The aim of sports training is to enhance physical performance, as training improves the capacity for energy production, tolerance of physical stress and subsequently improves the physical performance. The major physical changes associated with training occur in the first 6 to 10 weeks. The magnitude of these adaptations depends on the volume and intensity of exercise performed during training. The rate at which an individual adapts to training is limited and cannot be forced beyond the body's capacity for development (Wilmore et.al. 2004). The volume of work performed in training is an important stimulus for physical conditioning, there needs to be a proper balance between volume and intensity.

To achieve optimal adaptation, a well designed conditioning program is required that allocates the appropriate amount of aerobic and anaerobic conditioning time to match the energy demand of the sport (Powers et.al 1995) Overreaching leads to exceeding the athlete's adaptative capacity and there will be a performance decrement, but it will be relatively short (Armstrong ,and Van Heest. 2002). Overtraining often seems to be associated with periods of overreaching.

Increased training volume intensity may produce performance decrement and sign of overtraining including fatigue, hormonal changes and decrease in muscular strength and muscular endurance (Fry et.al.1991). Hence optimal training is in need that incorporates the principles of Periodization, in that the body needs to systematically go through stages of under training, acute overload, and overreaching to maximize performance (Wilmore et.al. 2004). The metabolic adaptations to training are specific to the type of training we do, such as endurance training results in metabolic and cellular changes that are associated with aerobic metabolism, sprint training tends to improve the body's ability to use anaerobic metabolism and resistance training increases maximal production as well as our anaerobic capabilities (Housh, and Devries 2000).

1.3 SWISS BALL TRAINING

Exercises are mostly designed with the part or the whole of the body to make physically fit. Different authors have made researches on all aspects of exercise training and their significance and effect on the physical fitness. Any specific conditioning for a particular activity will bring a definite change in

physical fitness level and having this in mind, a new set of exercises called physioball exercises were developed especially to improve fitness. (Author's Guide m 1999). They are of gym-ball, exercise ball, stability ball, flexibility ball, flex-ball, stretch-ball, Swiss-ball, therapy-ball, balance-ball, yoga-ball, fit or fitness-ball and work-ball etc.

Training on Swiss ball is being discovered by people of all ages for therapeutic rehabilitation and overall fitness. Rather than joining club buying costly equipment, one can get a total body workout with minimal time and less expense right in our own living room. This represents a major leap forward in exercise technology and balance training. They are simple products that can be used to improve strength, endurance, flexibility and core stability.

The gym-ball store products firm and tone buttocks, thighs and abdominals strengthen lower back, chest and arms, increases aerobic endurance and core stability, perfect for any age or fitness level used by professional athletes, also recommended by doctors.

Nothing works as efficient as the Swiss ball in isolating the abdominals, back and thighs for maximal results. After a long day of sitting, bending, twisting or lifting the Swiss ball revitalizes tired achy and stiff muscles while supporting the entire spine. Even while we watch TV, one can use this ball.

Swiss ball is one of the assisting tools in treating or in improving physical fitness (Jonir 2005) Swiss balls were previously used for physiotherapy; they are increasingly being used for workouts as well. Although its effectiveness has not been proven scientifically, Swiss ball exercises have

become increasingly popular especially in the last decade. However, it is well documented that performing exercises on an unstable surface, when compared a stable surface, arouses a greater influence on muscular activity and unstable surface training can be very effective for injury prevention and treatment. Conversely, it has been clearly proven that Swiss ball exercises decrease force output when compared a stable surface. But, in some respects, effectiveness of unstable surface training needs to be investigated deeply. Authors have underlined this missing point in the literature. Stanton, Reaburn and Humphries (2004) stated that while an abundance of anecdotal proof supports the use of Swiss ball training to improve physical performance; this has not been proven by valid scientific research. Pettitt and Bryson (2002) specify that Swiss ball training in theory will enhance afferent and efferent sensorimotor control, with feedback from the somatosensory system, the vestibular cochlear system, the cerebellum, and visual inputs. Additionally and very recently, Behm and Sparks (2010) indicated that more investigation is needed to conclude if the use of instability training to enhance balance and stability. Faries and Greenwood (2007) stated that “most of the research addressed the application of the trunk muscle has concentrated to evaluate activation only.

Traditional floor exercises such as sit-up, focuses on improving the potential of global but not local muscles. At that point, it should be noted that while work in harmony (Cholewicki & VanVliet, 2002). One surpassing characteristic of the Swiss ball training is that core stabilizer muscles are activated more on unstable rather than stable surfaces. Another advantage of the

Swiss ball sit-up exercise is the preventing of extra compressive force to spine that is generated in traditional sit-ups. Swiss ball sit-up exercise can minimize the load on the spine (McGill, 1998).

1.4 PLYOMETRIC TRAINING

Top level performance in sports could only be possible through scientific, systematic and, planned sports training as well as channelizing them into appropriate games and sports by finding out their potentialities among the several methods of training. (Carl, 1969)

Successful sports performance at the highest levels of competition often depends heavily on explosive power of the athletes involved. In many individual sports such as track and field events, gymnastics and diving ability to use high levels of strength as quickly and as explosively as possible is essential to performs at a elite level. Many team sports also require high levels of explosive power, such as basketball, volleyball and football for achieving success at elite levels of competition.

Until recent years, powers as it relates to sports performances has been the subject of limited research, but in the last decade or so researchers have realized the importance of training for power in a wide variety of sporting activities. Data has been produced for many elite individual and team sport athletes for physical and physiological characteristics, including standing vertical jump scores, related to specific sports performance.

Among the several training methods plyometric is one among them. Plyometric is a term that describes exercises that help 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. Dr. 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”.

The term polymeric was first coined by Fred Wilt after watching Soviet athletes prepare for their event in track and field. He felt this was a key to their success. Since its introduction in the early 1980s, two forms of plyometric have evolved. In the original version of plyometric created by Yuri Verkhoshansky of the former Soviet Union, it was defined as the shock method (Wilt, Fred, 1984, Yuri Verkhoshansky (1966). In this, the athlete would drop down from a height and experience a “shock” upon landing. This in turn would bring about a forced, involuntary eccentric contraction which was then immediately switched to a concentric contraction as the athlete jumped upward. The landing and takeoff were executed in an extremely short period of time, in the range of 0.1- 0.2 seconds. The shock method is the most effective method used by athletes to improve their speed, quickness and power after development of a strong strength base (Yuri Verkhoshansky (1966). Rather than using the term plyometrics to indicate exercises utilizing the shock method, it may be

preferable to use the term explosive or true plyometrics which can be considered the same as the plyometrics originally created by Verkhoshansky (Yuri Verkhoshansky (1966)).

According to the American Council on Exercise, and researcher results it was the plyometric training which used with a periodized strength- training program, can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness and overall pro-perception (Adams, et al., 1992; Potteiger et al., 1999; Paasukeet al., 2001; Miller et al., 2002).

Plyometric drills usually involve stopping, starting, and changing directions in an explosive manner. These movements are components that can assist in developing agility (Craig, 2004; Miller et al., 2001; Parsons et al., 1998; Yap et al., 2000; Young et al., 2001). Agility is the ability to maintain or control body position while quickly changing direction during a series of movements (Twist and Benickly, 1995). Agility training is thought to be a reinforcement of motor programming through neuromuscular conditioning and neural adaptation of muscle spindles, golgi-tendon organs, and joint proprioceptors (Barnes and Attaway, 1996; Craig, 2004, Potteiger et al., 1999). It is an essential factor to play Basketball and it has been influenced by the plyometric training. By enhancing balance and control of body positions during movement, agility theoretically should improve. Agility training objectives (Stone and O'Bryant, 1984) and plyometric activities have been used in sports such as football, tennis, soccer or other sporting events that agility may be

useful for their athletes (Parsons and Jones, 1998; Renfro, 1999; Robinson and Owens, 2004; Roper, 1998; Yap and Brown, 2000).

1.5 BASKETBALL

Basketball is an indoor sport invented by Dr. James Naismith. It is played by two teams consisting of five players per side. The objective of the game is to put the ball in to the basket through the opponent's basket and to, conversely, prevent the opponent from scoring. Every player is engaged at some point in a game, either ball handling, passing, shooting, and/or defensive techniques. Basketball is a sport that builds competitive success upon training and strength conditioning programs that encompass a broad variety of physical requirements. Like soccer and rugby, the basketball player must be able to perform all aspects of the game to at least a fundamental level.

1.6 FUNDAMENTAL SKILLS

To learn better skills in basketball, the players need to first understand and learn the basics of the game. In basketball, there are 6 different fundamental skill.

1.6.1 DRIBBLING

Use fingertips, not the palms hands. Basketball is played on the tips of the fingers and the balls of feet. Dribbling is one of the most fundamental skills. Not only is it important to learn how to dribble well, but it is important to know when, and when not, to dribble. One player who over-dribbles can kill a team's offensive motion and momentum. To become a good dribbler and ball handler, one must practice dribbling as often as one can, using both hands.

Dribbling the basketball is done to move the ball around only when a passing isn't a better option and a lane isn't available. Both new and experienced players make the mistake of dribbling the ball when it isn't needed. Dribbling should be done when the player (you) has some purpose to fill. Dribbling while looking for an offensive option is a good way to lose the ball. When you are looking for that option, take the ball in a firm grip and put your body between you and the defender. Regardless of how good you are at dribbling, the defense will always have a greater chance for a steal if you are dribbling the ball instead of gripping it in both hands.

1.6.2 PASSING

The object of the game is to throw a ball through an elevated basket on the opponent's side of a rectangular court. Players may move the ball by dribbling or passing with the hands. The inflated, spherical ball used in this game. There are different types of passes such as Chest Pass, Bounce Pass, Overhead Pass, and Wrap around Pass.

1.6.3 CHESTPASS

The chest pass is named so because the pass originates from the chest. It is thrown by gripping the ball on the sides with the thumbs directly behind the ball. When the pass is thrown, the fingers are rotated behind the ball and the thumbs are turned down. The resulting follow through has the back of the hands facing one another with the thumbs straight down. The ball should have a nice backspin.

1.6.4 BOUNCE PASS

The bounce pass is thrown with the same motion however it is aimed at the floor. It should be thrown far enough out that the ball bounces waist high to the receiver. Some say try to throw it 3/4 of the way to the receiver, and that may be a good reference point to start, but each player has to experiment how far to throw it so it bounces to the receiver properly. Putting a proper and consistent backspin on the pass will make the distance easier to judge.

1.6.5 OVERHEAD PASS

The overhead pass is often used as an outlet pass. Bring the ball directly above your forehead with both hands on the side of the ball and follow through. Aim for the teammate's chin. Some coaches advice to bring the ball behind your head, because it can get stolen and it takes a split-second longer to throw the pass.

1.6.6 WRAP AROUND PASS

Step around the defense with your non-pivot foot. Pass the ball with one hand (outside hand). It can be used as an air or a bounce pass. You will often see the wrap-around, air pass on the perimeter and the wrap-around, bounce pass to make an entry into the post.

1.7 SHOOTING

A player throwing the basketball toward the hoop is called shooter in Basketball. There are several skills that enable to score in a basketball game. One can score by performing the basic basketball set-shot, lay-up, and

hook shot. There is a general procedure that all good basketball shooters more or less follow.

1. Half-bent knees before shooting a basketball for more potential power
2. Dominant hand should have its fingers spread out
3. Only the fingertips should be gripping onto the ball
4. Other hand should support the ball on the side
5. The ball should be brought above the head in one motion
6. At this point, the angles at armpit, elbow, and wrist is at 90 degrees
7. While extending knees, extend forearm and snap your wrist
8. Make sure follow through with the wrist movement. If it feels natural to jump upon release, do so.

Shooting is probably the most practiced skill for new and experienced players. Yet so many people still practice it wrong. In practice all drills should be done at game speed and done as you would under pressure. Players are usually too lazy to do this and instead of practicing the sweet jump shot that they are constantly doing in the game they lazy-it-down to a hop-shot. Instead of jumping to give power they use their arms for the power and the legs give the rest. Practicing the wrong way to shoot is something that players do all the time yet they do not understand why they miss all their jump shots during the game

1.8 REBOUNDING

A player gains control of the ball after a missed shot at the basket. Rebounding is one of the most important aspects of Basketball. It is the primary way to get possession and can create more scoring opportunities for your team while limiting your opponents scoring chances. Many people think that one has to be tall to dominate on the boards, this is untrue. Many professional basketball guards such as Jason Kidd, Bonzi Wells, and Dwayne Wade rebound better than most big men. The key to rebounding is speed, timing and effort. Always box out when the shot goes up!

Rebounding can come in two forms - offensive and defensive. Lots of newer player look at rebounding and immediately think that it is a big man's area. Yet this is not so. Rebounding is more than just being big. It even surpasses just jumping ability. To be good at rebounding one needs skill and dedication. Skill is mainly the ability to position you and read the shots - something that comes quickly with practice. Dedication is probably the most important factor in rebounding. The person who gets the ball is the one with the most hunger for the ball and who is willing to do whatever it takes to get it.

1.9 OFFENSE

Offense is a fundamental which encompasses all aspects of the offensive court. Shooting has already been covered. Yet moving off the ball to give offensive options to the player with the ball is another thing that is essential for good offense. Supporting the team mates with screens and being able to locate

the best offensive option and get the ball to them are also essential things on offense. These skills are often overlooked.

1.10 DEFENSE

It is also a fundamental skill in which players defend or prevent the opposite team player from moving towards the goal or making attempt to put the ball in to the basket. The best defensive teams in the NBA are often the ones that make it into the playoffs. This is seen year after year so a simple conclusion can be made here - defense is key to victory. Defense is not only about getting the steal or block but also about intimidation of the opponents.

There are two defensive systems in basketball one is "Man-to-man defense" and other is zone defense. During the game each defensive player is assigned to guard a specific opposing player. He/ she may "switch" his/her player with another team-mate if he/she gets screened. Man-to-man defenders must learn the meaning of "on-ball" (defending the player with the ball), "deny" (preventing your man from getting the ball), and "help-side" (sagging off your man to help your team-mates prevent inside "penetration" (see Basic Defense). The term "close-out", refers to the method in which a defender quickly slides up to, and contains the ball-handler, or ball-receiver. Zone defense is a method of defense action; especially in basketball is that prevents the opponent to either move or pass the ball to his team mate in the particular zone.

Studies by the National Collegiate Basketball Association (NCAA) have found that an average segment of play during a game will last between 12 and 20 seconds. For this reason, basketball places its primary demands on the

human body's anaerobic energy system, with secondary reliance on the aerobic energy systems. In general terms, aerobic systems utilize oxygen to burn the bodily energy sources: first, glycogen (the source stored in the liver and muscles), next, fats, and lastly, proteins. Sports such as distance running and road cycling are aerobic sports. Anaerobic activities are those in which the body burns energy for the purpose of movement without utilizing oxygen; such sports usually require intense effort over a short period of time, such as sprinting or the pole vault. Basketball, as a sport of short, intense sequences, which reoccur over a longer period such as the course of a game or a practice, places stresses upon both the aerobic and anaerobic energy systems. For this reason, the most effective forms of basketball training develop the physical skills necessary to play the game by placing emphasis upon both energy systems. In previous basketball eras, it was thought that conditioning was best achieved in practice sessions that involved lengthy scrimmages, as well as running drills that were as much punishment as they were productive. Modern basketball training, as with the development of any higher level athletic skills, requires methods that incorporate fitness and sport-specific skills into each element of training.

To best achieve the objects of the game, basketball places a premium of the number of physical attributes including: quickness, lateral mobility, agility and balance, jumping ability, coordination, physical strength, and a combination of aerobic and anaerobic fitness.

Practices will involve several different elements. Drills that emphasize

rapid, well-balanced and controlled movements in all directions, with the player sliding in a crouched, athletic stance, are very effective. Basketball is a fluid game, and the player's ability to react to changing situations on the floor will be founded upon a proper stance. It is sometimes said that there are three types of basketball players: the player with the one-dimensional, straight-backed stance; the player with the two-dimensional stance, using the same upright stance and the feet wider apart; and the three-dimensional player, with feet apart, knees bent, and the body center of gravity lowered into a stable crouch.

As with any other athletic movement, a crouched position will tend to be more explosive, as the athlete can utilize the large muscle structures in the body core (hips, buttocks, and thighs). Drills that reinforce to the athlete that a lower and wider stance is ultimately a faster and stronger one will be useful.

Sample drills reinforce speed and control and include "slide" drills, in which the payer mimics full-speed defensive coverage. Shooting and passing drills are carried out at full speed with specific practice targets.

Jumping ability will be developed through specific drills based upon plyometric principles. This manner of training is calculated to build explosion when jumping on the floor. As such drills are typically done at levels at or near 100% effort, rest periods of 48 hours or more should be built into the training. During practice, the ratio of work to rest should be at least 1:3 to 1:5. Effective plyometric drills include hops from a squatting position, rapid step-ups, calf raises, and repetitive leaps. Stretching of the target muscle groups is of prime importance, both before and after this drill.

Hand-eye coordination and player agility can often be enhanced through individual drills with the basketball. Two- and three-ball dribbling exercises, in which the player must move at full speed keeping the balls under control with a proper dribble, are examples.

Basketball was invented as a non-contact sport; it has evolved into a discipline that has very pronounced physical elements. In the center, or post, and forward positions, the physical strength of a player will determine the success in securing rebounds, driving to the basket when the floor is congested with other players, dealing with an opponent's blocking techniques, and other maneuvers where significant contact is permitted in the course of play.

Overemphasis by a player upon muscle mass and muscular strength will likely result in the loss of other aspects of the game, particularly agility, coordination, lateral quickness, and speed in moving up and down the floor. The optimum balance between strength and agility for most players will be achieved through weight training that is primarily low weights with high repetitions, as well as core strength exercises such as Swiss ball, abdominal crunches, and lunge-type exercises.

1.11 Fitness Components

Speed is an ability to execute any given work in minimum possible time. It is an ability to react faster to a stimulus. The maximal rate at which an individual is able to move his entire body over a specific distance is considered to be his speed of movement. (Ghosh, 1980). It is also quite essential to play basketball game.

Speed can be influenced only to a limited extent and cannot be improved to a considerable extent like strength and endurance. Speed plays an important role in all sports except in endurance activities. Speed is the quickness of movement of a limb, whether this is the leg of a runner or the arm of the shot put.

Another important physical quality which determines the basketball player is agility. It helps the players to make pivot movement, dribbling the ball in different directions to deceive the opponent to score a basket. Agility is the complex coordinative and performance prerequisites which are primarily determined by mechanisms involved in the control and regulation of movements with speed (Singh, 1991). This quality no doubt plays a predominant role in the success of playing basketball. Agility must be understood as good coordination of kinesthesia of the whole body.

Strength is the basic quality, without which no sports movements could be possible, and it could be possible due to contraction and relaxation of muscles, the force is an ability to overcome resistance. Strength is a common conditioning ability which is a deciding factor in crucial situations.

The traditional way of building strength to get the muscles into action by increasing the resistance offered by them. Strength is basic to good performance in skills. Strength is valued highly as a measure of physical fitness, physical strength, and it determines one's abilities, capacities and potentialities that an individual does exhibit. There are various other factors such as arm strength, grip strength, back and leg strength and so on. Let us see which determine the

physical strength as a whole. Among them arm strength is an important factor. There are number of physical exercises and activities which develop arm strength to a great extent.

Strength is a conditional ability, that is, it depends largely on the energy liberalization process in the muscles. Strength is also perhaps the most important motor ability in sports as it is a direct product of muscle contractions. All movements in sports are caused by muscle contractions and, therefore, strength is a part and parcel of all motor abilities, technical skills and tactical actions. The role of strength training in general is for general health, good posture and for prevention of injuries.

Flexibility is defined as the ability to move joints or muscles through their full-range of motion. Flexibility is one of the five components of physical fitness. Flexibility is the most important one. Flexibility helps to move bodily parts easily, takes less time, energy to perform a task. Elasticity in muscle reduces tension and provides maximum length, thus yielding passive physical stretch. (Cureton, 1941). So it helps the player in all the movements, to play the game of basketball.

1.12 BIOCHEMICAL VARIABLES

In physiology, one learn how the organs, systems, tissues, cells and molecules within cells work and how their functions are put together to maintain the internal environment. Physiology is the science dealing with the study of human body functions. Exercise physiology is the study of how body's structures and functions are changed as a result of exercise. It applies the

concept of exercise physiology to training the athlete and enhancing the athlete's sports performance (Ajmer Singh, 2005).

Vigorous training, induce the blood circulation, blood and lymph stream through the muscle, supply the cells with oxygen and nutrition removing waste products. The heart activity is accelerated exercise and strengthening its own fibers. Exercise also stimulates growth, and strengthens the bones, muscles, ligaments and tendons (Hardayal Singh, 1984).

Biochemistry is the study of the chemical processes in living organisms. It deals with the structure and function of cellular components such as proteins, carbohydrates, lipids, nucleic acids and other bio molecular.

Exercises produce biochemical changes in the cardio respiratory system and other important alterations in body composition such as proteins, carbohydrates, lipids and triglyceride levels (Scharhag,et.al. 2008)

The investigator is interested to find out the influence of Swiss ball and plyometric training on biochemical variables, high density lipoprotein, low density lipoprotein, very low density lipoprotein, total cholesterol and triglyceride.

1.13 LIPIDS

A fatty or waxy organic compound that is readily soluble in nonpolar solvent (e.g. ether) but not in polar solvent (e.g. water). Its major biological functions involve energy storage, structural component of cell membrane, and cell signaling.

Mobilization of free fatty acids is important during aerobic exercise. As a consequence of anaerobic exercise, considerable mobilization of free fatty

acids occurs resulting in body fat loss. The exercise can beneficially alter blood lipid values and this is related to volume and intensity of training (Pollock and Wilmore, 1990).

The exercise reduces blood cholesterol and low density lipoprotein along with increased high density lipoprotein. These changes work together to reduce the risk of heart attacks and brain strokes (Grana and Kalenak, 1991). Whether this training has any influence of subject's lipids, is the study.

1.14 HIGH DENSITY LIPOPROTEIN (HDL)

A complex of lipids and proteins in approximately equal amounts, functions as a transporter of cholesterol in the blood. High levels are associated with a decreased risk of atherosclerosis and coronary heart disease.

The HDL contains the least amount of cholesterol. HDL may operate to protect against heart diseases in two ways: To carry cholesterol away from the arterial wall for degradation to bile in the liver and subsequently excreted by the intestines. To compete with the LDL fragment for entrance into the cells of the arterial wall.

A high level of HDL is associated with a lower heart disease risk, even among individuals with total cholesterol below 200 mg dl⁻¹. It is encouraging from an exercise perspective that HDL levels are elevated in endurance athletes and may be favorably altered in sedentary people who engage in either vigorous aerobic training or more moderate levels of regular exercise.

This plyometric and swiss ball may alter the HDL so to find out the influence of the selected train on HDL among the basketball players, the study was designed.

1.15 LOW DENSITY LIPOPROTEIN (LDL)

A complex of lipids and proteins, with greater amounts of lipid than protein transports cholesterol in the blood. High levels are associated with an increased risk of atherosclerosis and coronary heart disease.

LDL contains the greatest fat and least protein components. The LDL normally carries 60 to 80% of the total cholesterol and has the greatest affinity for the artery wall. They help to carry cholesterol into the arterial tissue to become chemically modified and ultimately cause proliferation of underlying smooth muscle cells and further changes that damage and narrow the artery in the process of coronary heart disease.

LDL's are means for transporting fat throughout the body for delivery to the cells, including those of the smooth muscle walls of the arteries. LDL is targeted for peripheral tissue and is associated with arterial damage. Elevated levels of LDL represent an increased risk.

1.16 BLOOD CHOLESTEROL

A measurement of the amount of cholesterol in somebody's blood is called as blood cholesterol.

Cholesterol, a sterol, is the most familiar of all the derived lipids.

Cholesterol synthesized from acetate in all animal tissues, is a precursor of cholic acid, vitamin D and the steroid hormones, including estradiol, progesterone, testosterone, and adrenal steroids. A high level of serum cholesterol and the cholesterol rich low density lipoprotein molecule are associated with an increased risk of coronary artery disease. Cholesterol

deposits on the inner lining of the medium and larger arteries result in atherosclerosis (McArdle et al. 1991).

It is proved that the physical exercises alters cholesterol level in the blood, and prevent heart diseases. Several authors demonstrated that there were not much influence of exercises on the lipids profiles and sports performance. Conversely few authors were recorded a positive result.

1.17 TRIGLYCERIDE

The major form of fat stored by the body is called as Triglyceride. A triglyceride consists of three molecules of fatty acid combined with a molecule of the alcohol glycerol. Triglycerides serve as the backbone of many types of lipids (fats). Triglycerides come from the food we eat as well as from being produced by the body.

Triglyceride is a glycosides in which the glycerol is esterified with three fatty acids. It is the main constituent of vegetable oil and animal fats. Triglycerides are formed from a single molecule of glycerol, combined with three fatty acids on each of the OH groups, and make up most of fats digested by humans. Ester bonds form between each fatty acid and the glycerol molecule. This is where the enzyme pancreatic lipase acts, hydrolyzing the bond and "releasing" the fatty acid. In triglyceride form, lipids cannot be absorbed by the duodenum. Fatty acids, monoglycerides (one glycerol, one fatty acid) and some diglycerides are absorbed by the duodenum, once the triglycerides have been broken down. Increased exercise and reduced carbohydrate consumption ameliorate one potential cause of insulin overproduction to help maintain sensible triglyceride levels. However trainings might have alter this variable,

and to trace out the influence of these selected exercises on triglyceride, this variable was chosen for this study.

1.18 NEED FOR THE STUDY

Swiss ball exercises have become popular and is well documented that performing exercises on an unstable surface, when compared a stable surface, arouses a greater influence on muscular activity and unstable surface training can be very effective for injury prevention and treatment. Conversely, it has been clearly proven that Swiss ball exercises decrease force output when compared a stable surface. But, in some respects, effectiveness of unstable surface training needs to be investigated deeply. Authors have underlined this missing point in the literature. Stanton, Reaburn and Humphries (2004) proved that abundance of anecdotal proof supports the use of Swiss ball training to improve physical performance. Plyometric training and Swiss ball exercises differ in consumption of oxygen by the body. Apart from the energy release the effect of these exercises on human system also differs. The physiological changes of these training resulted in improvement of physical fitness such as muscular strength, endurance agility and flexibility. But the level of improvement may not be same. And at the same time the biochemical variables is also need to be checked. As many research results revealed that the unstable training are supporting for the better sports performance. So the researcher is much interested in bringing out the two different trainings and its impact on the selected variables. And as far as my knowledge is concerned no study has been conducted so far to compare the effect of theses two trainings. The researcher selected the above topic for the above reason.

1.19 STATEMENT OF THE PROBLEM

The purpose of this study was to find out the effect of plyometric training and Swiss ball training on selected physical fitness and biochemical variables among university men basketball players.

1.20 HYPOTHESES

The following hypotheses were formulated to be tested and accepted or discarded on the basis of crucial observation and experiments.

1. It was hypothesized that plyometric training and Swiss ball training may significantly influence on selected fitness variables, explosive power, speed, agility and flexibility among university men basketball players.
2. It was hypothesized that plyometric training and Swiss ball training may significantly influence on selected biochemical variables, total cholesterol, triglycerides, low density lipoprotein and high density lipoprotein.
3. It was hypothesized that the plyometric training may have significantly greater influence on the selected fitness variables, namely, explosive power, speed, agility and flexibility than Swiss ball training among the university men basketball players.
4. It was hypothesized that the plyometric training may have significantly greater influence on the selected biochemical variables, namely, total cholesterol, triglycerides, high density lipoprotein, and low density lipoprotein than Swiss ball training among university

men basketball players.

5. It was hypothesized that the control group may not have any significant changes in physical fitness and biochemical variables when compared to treatment groups.

1.21 SIGNIFICANCE OF THE STUDY

This study is significant in the following ways:

1. The study will be significant in determining the effect of training on unstable condition
2. The study will be significant in assessing the fitness, and biochemical of university men basketball players.
3. The study will be significant in finding out the influence of plyometric training on selected fitness and biochemical variables among university men basketball players.
4. This study would be beneficial to Physical Directors and fitness trainers to prescribe suitable plyometric and Swiss ball training for the development of required components for the basketball players.
5. The findings of this study would be helpful to the basketball players in improving their fitness using Swiss ball exercises.
6. The findings of this study would be helpful for future researchers to undertake similar studies at different levels.

1.21.1 DELIMITATIONS

The following delimitations were recorded for this study.

1. The study was delimited to sixty university level basketball players as subjects from Thiruvalluar and VIT University Vellore in Tamil Nadu.
2. The subjects selected for this study were in the age group of 19 – 25 years.
3. The subjects were divided into three equal groups. Each group consisting of twenty each, namely, Swiss ball training group, plyometric training group and control group.
4. Plyometric training and Swiss ball training were selected and delimited for this study.
5. The study was delimited to the following fitness and biochemical variables.

Fitness Variables

- Explosive Power
- Speed
- Agility
- Flexibility

Biochemical variables

- High Density Lipoprotein
- Low Density Lipoprotein
- Total Cholesterol
- Triglycerides

1.21.2 LIMITATIONS

The study was limited in the following ways, which would be taken into consideration at the time of findings of this study.

1. The investigator has not taken into consideration of the past experiences

of the subjects in exercising.

2. The climatic conditions, diet and other daily routines of the subjects were not controlled.
3. The economical and social background of these students was not taken into consideration.

1.21.3 DEFINITION OF TERMS USED

The following terms used in this study are defined below.

TRAINING

In the words of **Csamadi (1966)** “training is a pedagogical process which makes possible the achievement of high standard performances without any physical or mental damage, through the planned systematic development of certain specific skills, physical capabilities and the adaptation of the organism”.

Training is defined as "a systematic process of repetitive, progressive exercise or work, involving the learning process and acclimation" (Arnheim 1985).

PLYOMETRIC TRAINING

According to Will and Freeman (1980) , “plyometric is defined as exercises based upon the belief that a rapid lengthening of a muscle just prior to a contraction will result in a much stronger contraction.

SWISS BALL

Swiss ball is a ball, which is filled with air, and it has a mobile platform, which gives bouncy effect to the body, thereby the body should align and maintain balance while performing exercises.

SWISS BALL EXERCISES

Physioball exercise is one of the active, reactive exercises in which closed kinetic chain exercises are possible. The examples for closed kinetic chain exercises are squat, lunges, pushups, dips. (Zubay, 1984)

FITNESS

Fitness is the utilization of excessive calories by a cardiovascular and muscular process bringing the body to optimum efficiency. (Kennedy 1988)

EXPLOSIVE POWER

It is the capability of the individual to relax maximum force in the shortest period of time (Mathews, 1981).

Baungarther (1987) states that the explosive power is the ability to relax maximum muscular force in the short test as in executing a standing jump.

SPEED

Speed is the ability of an individual to make successive movements of the same kind in the shortest period of time. Hardayal Singh (1984) defined speed as “ability to execute motor actions under given conditions in minimum possible time”.

Mackenzie (1999) defined that speed as “the quickness of movement of a limb, whether this is the leg of a runner or the arm of the shot putter”.

AGILITY

Agility is the ability to change directions quickly and control body weight movement (Singh, 1991).

The speed with which an individual may change his body positions or

fastness in changing directions while moving is known as agility (Mackenzie, 1999).

FLEXIBILITY

Flexibility is the range of motion around a joint. (**Johnson and Nelson 1988**).

High Density Lipoprotein (HDL)

HDL, a type of protein molecule carried in the blood that removes cholesterol from tissues and appears to protect against coronary heart disease. Reduces the development of atheroma and atherosclerosis. HDL was estimated by phosphotungstate method and is expressed as mg/dl. (**Zubay, 1984**)

Low Density Lipoprotein Cholesterol (LDL)

Low Density Lipoprotein Cholesterol is the major cholesterol carrying lipoprotein. Elevated LDL levels herald a strong predisposition to coronary heart disease, stroke and peripheral vascular disease.

Triglycerides (TG)

Triglycerides are composed of the three carbon molecule glycerol and three fatty acids, one attached to each of the glycerol carbons. Triglycerides make up 95% of the fats found in foods. TG's were estimated by enzymatic calorimetric method and expressed as mg/dl. (**Zubay, 1984**)

Cholesterol (TC)

Cholesterol is the fatty substance formed in the blood. Cholesterol is a white fatty alcohol of steroid group, found in body tissue, blood and bile, assists in synthesis of vitamin D and various hormones.