CHAPTER – I

INTRODUCTION

In the 21st century football is the most popular sports, being played in every Nation. Football is complex sports, where many components contribute to best football performance. As with other activities, football is not a science but science may help to improve the performance of football players. Efforts to improve football performance often focus on techniques and tactics at the expenses of physical fitness. Success in football depends upon variety of factors including the physical characteristics and physiological capacities of the players, their level of skill, their degree of motivation and tactics employed by them against the opposition.

Sports training

Sports training programme designed in a systematic and logical order so as to stimulate the enhancement of specific physical and physiological qualities. Variation is essential in development as it will stimulate adaptation, avoid overtraining, potentiate subsequent phases, encourage recovery and lead to elevations in performance. Haff et al., (2008), Hodges et al., (2005), stated that generally there are many ways to introduce training variation into a sports training programme including but not limited to training load, exercise selection, intensity, volume, time under tension and rest periods used. Changes in training program design may lead to more rapid increases in performance.
Complex training

Chu,(1996) state that complex training and plyometric training appears to have its origin in eastern European. Explosive drills precede the strength exercise. Kukuric(2009), state that complex training was discovered by Russian and Bulgarian trainers. It’s the combination of large and small ballast during training. Hence these forms of combination exchange make muscles to contract explosively in same muscle group. These type of training in science and sports practice are known as complex training. According to the Docherty et al., (2004), complex training involves performing set of weight training exercise before set of related plyometric exercise such as five set of bare bell lunge before five set of box jump march.

Several studiessuggest thatcomplex training significantly develop strength activities, improves neural activities, develop the rapid rate of force in the type two fibers which is essential to produce maximal power, beneficial for performance of athletes and resistance training increase muscle mass. Complex training is a combination of Concentric, eccentric, concentric contraction of muscles exercise which directly effect to produce rapid muscular force(Rajamohon 2010, Ebben&Watt 1998 and Ebben 2002). Fatomous et al., (2000), Evaluated the effect of Plyometric training, Weight training and their Combination on Vertical Jump performance and leg strength.

Resistance training

Resistance training is used as a general phrase synonymous with other common term such as strength training and weight lifting. Resistance training is described as specialized form of conditioning that is used to increase one ability to resist or exert force (American Orthopedic Society for Sorts Medicine, 1988). Resistance training increases muscle strength by different physiological mechanism, which are related to neural factor
Strength training exercise that uses weight/resistance to strength and enhance a muscular ability to contract and do work. Strength training can be classify into two types [i] general strength training exercises are those they are using in overall body conditioning. General exercise plays an important role in the initial stage of player performance. [ii] Specialized exercises to develop a base upon which a specialized exercise can be performed most effectively (Ballock, 2008).

According to Deproft et al., (1988), stated that strength training improves muscular strength and kicking performance for the football players. Falk&Mor (1996), had observed that resistance training improve the selected motor fitness skills among athletes. According to the Chandler & Kibler (1995), found that the strength training is significantly prevent injury, recovery from injury and improve balance, endurance, flexibility, coordination and stamina.

Since the influence of resistance training depends upon the duration, frequency, speed and volume of the training programme. Soccer player need weight training in the physical fitness programmein order to enhance their anaerobic capacity and muscle fitness and also recommended that best intensity training for soccer group is 50-60% of one repetition maximum [1RM] (Shahidi et al., 2012). Kravitz et al., (2003), stated that maximum repetition at 70% of 1RM were better predictor of 1RM for squat and bench press than at 80% and 90% of 1RM. However for dead lift 80% and 90% of 1RM was better predictor. Pereira & Gomes (2003), stated in their studies that the number of repetition for a given % of 1RM is different for different exercise, so is the load for a given number of repetitions maximum (nRM) when compared at different velocities.
Plyometric training

Fred Writ (1920-1994) a coach from Unites state of America first introduce the term Plyometric training. The word plyometric can be divided into two parts into Latin roots. Polio which means more and metric means measurable this implying measurable increase (Chu, 1998). According to Russian literature, Plyometric training had its early roots in the mid 1960’s (Radcliff & Farentino’s, 1999). In the 1970 other eastern Europeans countries such as Germany, Bulgaria and Romania began and it calling ‘Jump training’ (Chu, 1998).

Plyometric exercise movement involves rapid eccentric and concentric muscle action this type of training develops explosive muscular performance (Fowler & Kravitz, 2011). In the study by Bruce & Smith (2007), Recommended after critical review of literature explosive exercise poses considerable injury risk and encompasses that slow, controlled weight training in combination with sports specific training is all necessary to enhance both muscular strength and power. In turn improve actual sporting performance. Slow training increase acceleration performance and fast training improve speed maintains.

Core training

Soccer skills are often performed in unstable body position and dynamic in nature. Such as dribbling, passing, kicking, goal keeping. Which needed resistance exercise designed to trained core stability. Core stability allows the body to maintain dynamic equilibrium of the trunk during performing football skills. The core muscles refer to the abs and lower back muscles. Core muscles considered to be epicenter of the human body (Scott, (n.d.)). Zanzulak et al., (2008), stated that core stability training is the body to maintain dynamic equilibriums of the trunk as result of dynamic and external disturbance.
Bermark (1989), divided the core muscles into active muscles subsystem into global and local group based on their role. Global group consist of the large superficial muscles that transfer force between the thoracic cage and pelvis and act to increase intra-abdominal pressure namely internal and external oblique’s, rectus abdominals, transverse abdominal, lumbered, quadratus and erector spine. Local group consist of small deep muscles that control inter segmental motion between adjacent quadruped or spine body position. Therefore active muscles subsystem is necessary allow support of body mass and additional loads associated with resistance exercise and dynamic activities.

Willardson (2007), suggest on the base of the related literature that core stability helps to improve sports performance. Traditional resistance exercise on unstable surface rather than stable surface, exercise and unilaterally develop stability. Exercises perform while standing on a stable surface increase core strength and power. Free weight exercise perform specific to core stability requirements of sports related skills due to moderate level of stability and high level of force production. Small load and long tension times are recommended for increase of core endurance. Pedersen et al., (2006), suggest that unique functional stability training program involving movement performed in unstable slings clearly improve static balance and reduce low back pain and improve kick performance.

Bio motor ability

Perfect and effective movements almost in all the sports depends on the bio motor abilities. Bio motor abilities are involve in all the sporting activities including soccer. In fact it determines the level of performance in any sports. In all the sports, combination of three major bio motor abilities components such as speed, strength and endurance, lead to various result in sports. The cooperation of bio motor abilities components to reach high and perfect performance level in sports.(Bompa, 1999).
Pufaa (2006), stated that motor means muscles able to produce movement. Motor unit is a family of nerves and muscles that brings about a body movement. Motor ability is motor skill. A skill is the ability to do some things expertly and well. Motor ability is the ability to perform movement well and expertly. Motor ability if well develop can enhance the ability of the athlete to perform well.

Thompson (1991), stated that the sports training programme use exercise or practice to develop the qualities required for events. Further which recommended the five basic bio motor abilities such as strength, endurance, speed, flexibility and coordination.

When the load of an exercise is maximal it is a strength exercise,
If the distance of duration or duration is maximum the exercise becomes endurance,
Quickness and frequency of movement would give a speed exercise,
Exercises that have relatively complex movement are called coordination.

Orlando (2009), concluded in his literature after review of many literature and exclusive interview the knowledge of bio motor abilities and use of bio motor abilities in the development of athletes in their perfect sports performance. Bio motor abilities play an important role in the development of athletics and perform at high level. The result of the study also indicated that the development of bio motor abilities had a positive effect on the extent athlete can perform.

Agility

Agility is usually achieved when a person is using their anaerobic power. The ability to change direction and react to different stimuli is a requisite of many sports, particularly team and racket sports (Young et al., 2002). Sporisand others (2010), had concluded that well known training methods such as resistance training and plyometric training, strength and conditioning training programme of athletes striving to achieve a high level of explosive leg
power and dynamic athletic performance. Bangsbo(1996), during a soccer match a player frequently perform an activity that requires rapid development of force, such as sprinting or quickly changing direction. Sporis et al., (2011), their study had shown that basic skills without the ball have much stronger relation among speed, agility and quickness than the skill with the ball.

Balance

Balance can be divided into static and dynamic balance. Static balance is ability to maintain the body within the base or ability to sustain the body in equilibrium (Olmsted et al., 2002). Whereas dynamic balance refers ability to maintain equilibrium during a transition from dynamic to a static state (Ross & Gukiewicz, 2004).

Motor skills while moving the trunk or core provides structural support mechanism reducing the potential fall. Football sport requires sudden stops and cutting movement and football skill requires dynamic balance through core stability, allowing the body to maintain dynamic equilibriums of the trunk. Balance is comprised of the dynamic reaction of involuntary sensation and impulses that maintain an upright stance and is necessary for most functional movement (Frank & Earc 1990). Lephart et al., (1997), stated that success in sports performance depends on both balance and functional movement. According to the Yaggie & Campbell (2006), suggested that balance training improves dynamic skill, selected sports related activities and postural control measure. According to the McGunie & Keene (2006), suggest that balance training programme will reduce the rate of ankle sprain by 38 percentages. Larcom (2013), study result indicated that balance training significantly improves dynamic balance among elite football players.
Coordination

All sports essentially require the coordination of eyes, hands and feet and may be an implement and a ball. Where as in footballer requires foot eye and ball coordination to perform the skill. Coordination can be classified as general and specific coordination. General coordination is ability to perform various motor skills, irrespective of sports specialization. Whereas specific coordination is ability to execution of many repetition of sports specific sills during selected sports activity (Bompa, 1999).

Newell (1985) Coordination is the relative movement between interacting body parts and the object to be interception during goal directed behavior. According to Guskiewiez & Perrin (1996), coordination is to perform complex set of movement that requires rhythm, muscular tension, posture and equilibrium.

Explosive strength

Explosive strength ability to exert a maximal amount of force in the shortest possible time interval such as football player exploding off the line and sprinter forcefully driving starting blocks. Power which is result from explosive strength (Power \( P = \text{Force} \times \text{Velocity} \)). Football players enjoying explosive power (Alikhajeh et al., 2012). Explosive power is required for many vital skills in soccer such as striding, turning, kicking, sprinting and Jumping (Bangsbo et al., 2006). Power is the ability to exert force at higher speeds. Power is the product of force exert on an object in the direction in which force exerted (Baechle, 1994). Power is the combination of strength and speed. Dynamic strength coupled with movement speed. Speed is the ability to apply force rapidly (O'Shea & Patrick, 1994).
Sotlen et al., (2005), Consider power the ability to produce as much force within the quickest period of time, to be as important as strength and endurance in Soccer performance. Hunter (2009), Found a significant relationship between power and Soccer performance. According to the Mujika et al., (2009), explosive lower body muscular power and sprint speed are two high intensity, interrelated, physiological capacities which contribute to soccer performance.

Flexibility

Flexibility terminology range of motion in the joint, Musclotendonious unit length and musculotendinous unit flexibility. A range of motion available in a joint, or in a group of joint, that is influence by muscles, tendon and bones (Anderson & Burke, 1991). According to sports fitness advisor flexibility of the body’s muscles and joints play an integral parts in many athletic movements or during football game. Flexibility is of three types [i] Dynamic flexibility ability to perform dynamic movement within joint i.e. kicking an imaginary ball [ii] Static active flexibility ability to stretch an antagonist muscles using only the tension in the agonist muscles [iii] Static passive flexibility ability to hold the stretch using weight or some external forces. Witvrouw et al., (2003), their study found the result after analysis of literature in soccer player with hamstring muscles flexibility less than 90° have significantly higher risk for injury. Engebretsenet al., (2010), found after multivariate analysis, a history of acute hamstring injury was found to be significant risk factor among soccer player. Cross & Worrell (1999), suggest that by joint range of motion, performance may be enhanced and risk of injury reduce.

Muscular endurance

Cook (2003), explain that muscular endurance and muscular strength work together to produce quality performance and cannot be trained in isolated. Since the football is an
anaerobic sport which requires short and powerful bursts of power and period of short recovery. Football player must have both muscular strength and endurance to resist fatigue, avoid injury and last longer in the game.

Muscular endurance is ability to perform many repetitions with a sub maximal resistance over a given period of time. Muscular endurance are two types [i] Dynamic muscular endurance means muscle ability to contract and relax repeatedly [ii] Static muscular endurance means muscles ability to remain contract for a long period. The best method for developing muscular endurance is repetition effort or [RE]. Muscular endurance test based on number of repetition are performed with submaximal load i.e. repetition of push-ups or abdominal curls. Short duration endurance training increases strength and at the same time increases the ability of athletes to endure against a relatively high resistance. The number of repetition in short duration train is 15 to 25times \((Rahamani-Nia 1995 \ & \ Wong, \ et \ al., \ 2009)\).

Muscular strength

Muscular strength is component of both health related and sports related physical activity. Muscular strength means ability of a muscle group to develop maximal contractile force against a resistance in a single contraction. Muscular strength are classify into two types [i]static or isometric, which involves no changes in muscle length [ii] dynamic muscular strength involves either eccentric or Concentric action \((Heyward, 2010)\).

Muscular strength is assessing by one repetition maximum (maximum amount of resistance you can overcome one time). 1RM test are usually conducted on resistance machine. Strength can also be measure by using dynamometer. Muscular strength is important for maintain a players balance on a slippery pitch and in ball control. When resistance training added to the normal soccer training programme it improves both muscular
strength and kick performance (*Reilly & Doran, 2003*). During the football game muscular strength is essential because each player perform dynamic movement such as sprinting, throw in, kicking, tackling and heading. So power, endurance and strength are needed to compete in the football game (*Bangsbo, 1994*). According to the *Le Gall et al., (2006)*, majority of the football player’s injuries are occurring in the lower extremities. *Croisier et al., (2008)* suggested that the development of strength symmetry and balance ratio in the function of knee flexors and extensors can reduce the incidence rate of Soccer injuries.

**Speed**

Speed or lack of speed directly responsible for loss or win the Football game. Soccer speed in Germany defines as the ability to react to as stimulus in the least amount of time through cyclical or a cyclical movement with limited resistance (*Thyron, 2009*). *Weineck (1992)*, explain that characteristic of speed are significantly related to the football players performance and classify football speed into seven categories game action speed, action speed with ball, movement speed with ball, reaction speed, decision making speed, anticipation speed and perceptual speed.

Sprint speed plays a potential role of being successful in the field of football game. Sprinting requires the ability to quickly accelerate (*Bompa&Carrera, 2005*). According to *Baker & Nance (1999)*, speed and acceleration are important aspects in football game.

Speed can be improved by strengthen the muscles (*Akgun, 1996*). According to *Bompa(1994)*, one of the most important bio motor abilities requires in sports is speed or move very quickly or capacity to travel. From the mechanical point of view speed express through ratio between pace and time. The speed included with three components [i] reaction time [ii] frequency of movement per time unit [iii] speed travel over a given distance.
Physiological function

Physiology of soccer players is characterized as high-intensity, intermittent, non-continuous exercise (Hoy et al., 1992). The physiological responses to exercise are dependent on intensity, duration and frequency of exercise as well as the environment condition. The human body under goes adaptation on a continuous basis. Virtually every process and organs with in the body is affected by exercise. The Physiology of exercise system is tend to center upon the most important physical system to athletic performance the cardio vascular system, the cardiorespiratory system, the thermo regulatory system, body composition and muscular skeletal system. According to Paton & Hopkin (2004), high intensity interval and resistance training in endurance athlete’s noncompetitive phase can substantially improve performance and related physiological measures. According to Butcher & Jones (2006), high intensity exercise training has shown to elicit greater adaptation in several physiological system than those that are elicited in response to lower intensity training. Barnes et al (2013), stated that different uphill training approaches appear to induce specific physiological and mechanical adaptation, which suggested that uphill training should carefully matched to the strength and weakness of the athletes. According to Helgerud & Reilly (2002), normal running have less physiological stress when compared with running with ball.

Physiological adaptations are associated regarding resistance training can produce either positive or negative to sports performance. Negative transfers could occur if there is increase co activation of antagonist muscles because this would produce force that opposite the intended movement direction (Corroll et al., 2001). According to Baratt et al., (1988), positive transfer can occur if resistance training reinforces the optimum muscles activation patterns that are required in the execution of the sports skills. According to Schmidtleicher (1992), inter muscular coordination refers to the interaction between muscles that control a
movement, but neural adaptations confined to single muscles might also explain performance enhancement from training and have thus been termed intramuscular coordination.

**Blood pressure**

Blood pressure is measured in millimeters of mercury (Hg). Blood pressure consists of two numbers, [i] Systolic blood pressure value [ii] Diastolic blood pressure value. The optimal Systolic blood pressure value should be below 120mm Hg and optimal diastolic blood pressure value should be below 80mm Hg. The normal range is from 120 to 130 mm Hg and from 80 to 85 mm Hg. Systolic blood pressure is the pressure in the arterial system when heart beats and contract. Diastolic blood pressure between contractions or when heart is at rest between beats *(Cleve labs, 2006).*

Regular Football training leads to an increase in left ventricular wall thickness among football players *(Akgun, 1994).* According to the *Zdravkovic et al., (2010)*, dynamic exercise causes left ventricular volume overload and static exercise causes left ventricular pressure overload. *Gokhan et al., (2013)* state in their study that systolic blood pressure level of football players was significantly lower than control group and that mean left ventricular diameter of football player were significantly higher than the control group. *Cornelissen & Fargard (2013)* suggest that endurance aerobic training decreases blood pressure through a reduction of and favorably effects concomitant cardiovascular risk factors. *Berger (2013)*, after review of literature found that prevalence of high blood pressure in professional football player was low, reduce arterial compliance, increase left ventricle mass and left arterial volume. *Leddy (2009)*, found that hypertension in physically active people and athletes are lower than the general population. *Miller-Craig et al., (1978)*, stated that blood pressure was lowest at 3-am and began to rise again during the early hours of the morning before waking.
Resting heart rate

Resting heart can be explained as the number of times heart beats per minutes while at complete rest. The unit for measuring resting heart rate is bpm which means beats per minutes. Recently new research has founded that heart rate determine not only how hard you can do exercise, but it also it indicate how healthy your cardiovascular system. Resting heart is an indication of your aerobic fitness and also it indicated the recovered adequately from yesterday’s training session (Reents, 2014).

Alexender, et al., (2012), after brief review he found that heart can be used to monitor the physiologic load and internal training load in football players especially when analysis is considered as function of heart rate at rest or at least with heart maximum. A heart rate response varies according to the playing position i.e. Midfielder present greater exercise intensity followed by forwards and full backs. Competitive match intensity is described as 80-90% of HRmax.

American College of cardiology define the sudden cardiac death as non-trauma and unexpected sudden death that may occur from a cardiac arrest, within 6 hours of previously normal state of health. The main common cause of sudden cardiac death among young football players are hypertrophic cardiomyopathy, congenital coronary anomalies and arrhythmogenic right ventricular dysplasia (Maron, 2003). In 1996 American association released a scientific statement advocating Universal cardiovascular preparation screening for young athletes in attempts to identify those who are vulnerable to cardiovascular events (Maron et al., 2003). According to the Farahani et al., (2010), twelve elements complete history and physical examination before competitive sports.
**VO₂max**

VO₂max is the indicator of cardio respiratory fitness, which corresponds to the highest rate at which oxygen can be taken up and utilized for by the body during maximum exercise, breathing atmospheric air at sea level. Other variables such as ventilator threshold and running economy are used in conjunction with VO₂max to increase the prediction of endurance performance in athlete *(Basset & Howely, 2000).* According to the *Willmore&Costill (2005)*, VO₂max often called as maximal aerobic capacity or maximal oxygen consumption. Whereas V stand for volume, O stands for oxygen, Max stands for maximum. According to the *Hickson et al.,(1981),* VO₂max changes with changes in training. *Denadai(1999),* VO₂max is the main indicator of maximal aerobic power. *Chamari et al.,(2005),* state that the Football players’ aerobic capacity certainly plays an important role in modern football game and has a major influence on their technical performance and tactical choice. According to the *Stolen et al., (2005),* top class football players are characterized by moderate to high maximum oxygen uptake VO₂max that is 57 to 75 ml/kg/min. *American Thoracic Society(2003),* American thoracic society stated that maximal aerobic capacity or VO₂max is an integrative measure of the ability of lungs to supply, the cardiovascular system to pump and transport oxygenated blood to the exercising muscles and, the ability of the working muscles to use oxygen. According to the *Wagner (1996),* VO₂ max is defined as the highest oxygen uptake that can be achieved during dynamic exercise with large muscle groups.

**Skill related performance**

The sports scientist mentioned that the players have to spend a considerable amount of time trying to improve performance through practice related activities *(Ericsoo et al., 1993, David & Slabode 1998 and Kramer & Romer 1993).* The skill performance of the
soccer player depends upon the player’s physical, tactical, technical and socio psychological abilities (Stolen, 2005).

Athletes achieve high level of performance through resistance training. This training is used to develop the athlete’s strength, power, flexibility and speed. The improvement of these factors help to enhancing the athletes’ performance on her respective playing field (Pearson and Gehlsen, 1998). Physical Characters and skill performance level of football player have a major impact by resistance training (Arthur & Baileys, 1998). According to Stone et al., (2000), Strength and conditioning program have shown to improve strength, power, speed and vertical jump measure. The increases in these variables have been improve athletic performance.

Bale et al., (1994), mentioned in the study that body weight play important role while skill performance. While having an excess amount of fat may be detrimental to the athletes’ performance. Johnson (2001), conclude in the study that the receiver, corner back, rover linebacker, whip linebacker and safeties indicated that power is the most important factor. In case of inside linebacker, tight-end, quarter back, tail back, full back and defensive end shows that speed is the important factor and whereas defensive tackles and offensive line man. In the offensive line man consist of guard, tackles and the center body weight is the most important factor in performance of football skill. Carling & Dupout (2011), found that the football players were generally able to maintain skill related performance throughout the games and when competing in successive matches with in a short time.

Goal kicking accuracy

The main aim of the football game is to score goal. To score goal football player need to develop good shooting technique and a positive attitude toward taking goal shots whenever they have a good opportunity (Special Olympic Football Coaching Guide, 2004). Kicking
accuracy is most important components of soccer performance. Kicking accuracy can be explains as the ability to kick the ball at specified area (Finnoff et al., 2002). Ferraz et al., (2012), found that negative influence of fatigue upon the ball velocity in soccer kicking. Mohr et al., (2002), their study found that fatigue result in decline of soccer performance. Several studies Forestier & Nougier (1998) & Madign & Pidcoe (2003), suggest that many factors that reflect in the soccer kicking such as muscular strength, body posture, foot wear, fatigue, technical approach and power output. The studies related to soccer kicking accuracy are in form of technical analysis, bio mechanics, muscles involvement during kicking action and footwear. According to the Bubanj et al., (2010), angle of attack of the swing foot of the soccer players significantly differed compared to angle of approach of soccer players (0, 30 and 60 degree).

**Passing**

Passing is considered to be a very essential skill for a good foot baller. It is used to pass the ball to a team-mate in the most accurate way. But if in case of long pass more force is applied and if player standing quiet close to you less force is needed. Football is a team game. Playing as a team requires each player to be able to pass the ball well. Through passing, a team can quickly counter attack from defense maintain possession in mid field and set up opportunities to score (Special Olympic Football Coaching Guide, 2004). According to the Russell et al., (2011), football specific exercise influenced the quality of performance in gross motor skill such passing. Russell & Kingsely (2011), found that aerobic training fluid-electrolyte provision and acute carbohydrate supplementation have been to improve the proficiency in technical action performed after soccer specific exercises.
Dribbling

Dribbling means pushing or carrying football with foot in the desired direction. The dribbler must keep the ball always under control. Important aspect of dribbling is balance and Coordination. Player must be able to go around a player, the body most be flexible enough to change direction by shifting the weight quickly, while still maintain balance and ability to think quickly (Special Olympic Football Coaching Guide, 2004). According to the Cometti et al., (2000), dribbling in soccer can be classified into dribble action while accelerating and dribbling action with quick changes in direction. Acceleration plays an important role while covering short distance by football player. According to the Mohr et al., (2003), footballer ability to sprint and dribble at high speed is essential for high performance in football game. According to the Barbara et al., (2010), sprinting and dribbling should be improve, the factor that contribute to dribbling performance are lean body mass, hours of practice and playing position.

Juggling

Juggling a football is a gross motor skill and it involves major large muscles group such as hamstring and quadriceps (Redahav, 2011). According to Coaching American Soccer explain that Juggling is the skill of the footballers with the football repeatedly striking the football in order to keep in air. By doing juggling usually it develop soft touch on the ball and control on ball (Harves, 2013). Juggling football refers to keeping the football in the air by bunching it off your feet, chest, head, thigh and other parts of the body. The values of the juggling are Football control, improving basic balance and improving basic soccer skill (Testto111, 2013).
The objectives of the study

The objectives of the study includes following

1. To investigate the effect of complex training on selected bio motor ability, physiological and skill related performance variables of men football players.

2. To investigate the effect of core exercise programme on selected bio motor ability, physiological and skill related performance variables of men football players.

3. To investigate the effect of complex training with core exercise programme on selected bio motor ability, physiological and skill related performance variables of men football players.

4. To compare the effect of complex training, core exercise programme and Complex training with core exercise programme on selected bio motor ability, physiological and skill related performance variables of men football players.

Statement of the problem

The purpose of this study was to find out the influence of complex training with core exercise programme on selected bio motor ability, physiological and skill related performance variables among men football players.

Hypotheses

It has been scientifically approved that any systematic progressive training over a continuous period of time would be lead to produce changes on athletic qualities. Based on this concept, the following hypotheses were drawn.
1. It was hypothesized that there would be significant differences due to the influence of complex training, core exercise programme and complex training with core exercise programme on selected bio motor ability variables namely agility, balance, coordination, explosive power, flexibility, muscular endurance, muscular strength and speed of football players.

2. It was hypothesized that there would be significant differences due to the influences of complex training, core exercise programme and complex training with core exercise programme on selected physiological variables namely systolic blood pressure, diastolic blood pressure, resting pulse rate and Vo2 max of football players.

3. It was hypothesized that there would be significant differences due to the influences of complex training, core exercise programme and complex training with core exercise programme on selected skill related performance variables namely goal kicking for accuracy, ground passing for accuracy, air passing for accuracy, dribbling, juggling I and juggling II of football players.

4. It was hypothesized that the complex training with core exercise programme would be superior to complex training and core exercise programme on selected bio motor ability, physiological and skill related performance variables of football players.

5. It was hypothesized that the complex training, core exercise programme and complex training with core exercise programme would significantly improve selected bio motor ability, physiological and skill related performance variables when compared with the control group of football players.
Delimitations

The study has delimited to the following aspect:

1. The study was delimited to sixty men football players from Acharya Nagarjuna University, Guntur district of Andhra Pradesh.

2. The age of the subjects were ranged from 18 to 25 years.

3. The study was delimited to inter collegiate level men football players.

4. The duration of the experimental period was restricted to 12 weeks.

5. The selected criterion bio motor ability variables were delimited namely agility, balance, coordination, explosive power, flexibility, muscular endurance, muscular strength and speed.

6. The selected criterion physiological variables were delimited namely systolic blood pressure, diastolic blood pressure, resting pulse rate and Vo2 max.

7. The selected criterion skill related performance variables were delimited namely goal kicking for accuracy, ground passing for accuracy, air passing for accuracy, dribbling, juggling I and juggling II.

8. The independent variables were delimited namely complex training, core exercise programme and complex training with core exercise programme.
Limitations

The uncontrollable factors associated with the study were accepted as limitations, which are given below.

1. The previous experience of the subjects in the field of sports and games which might influence the training were not considered.
2. The influence of weather conditions such as atmospheric temperature, humidity, and metrological factor during testing and training period were also not considered.
3. The heredity of the subjects and its influences on the selected criterion variables were not taken into consideration.
4. Though the subjects were motivated verbally, no special attempt was made to increase their motivation in order to get positive results during testing and training.
5. The investigator could not completely control the quantum of physical exertion, rest period, life style, food habit and other day to day activities.
Operational definition and explanation of terms

Training

Training is a pedagogical process, based on scientific principles, aiming at preparing sportsmen for higher performance in sports competition (Singh, 1991).

Progressive resistance training

Exercise in which a load is increased in pre-determined steps: Ideally the increments will be sufficient to apply the over load principle but not great enough to accuse damage. Progressive weight training is generally based on the repetition 1 (RM) (Kent, 1994).

Intensity

The relative effort required to complete individual set or an entire workout. Intensity is a function of resistance used in each resistance training (Wikipedia, 2010).

Repetition

A repetition is one complete movement of an exercise. It normally consists of two phases: concentric muscles action or lifting of the resistance and the eccentric muscles action or lowering of the resistance (Wikipedia, 2010).

Set

This is a group of repetitions performed continuously without stopping while a set can be made up any number of repetitions (Wikipedia, 2010).
Skill

Is the ability to use the right muscles with the exact force necessary to perform the desired movement in the correct sequence and timing (Jenson & Herst, 1980).

Performance

The ability to perform (The world book encyclopedia, 1980)

Complex training

Complex training is a workout comprising of a resistance exercise followed by a matched plyometric exercise (Chandrashekar, 2007).

Plyometric training

Plyometric training refers to speed-strength, a combination of strength and speed is power (Shekar, 2007).

Resistance training

Resistance training is concerned with improving the condition of the body in terms of muscular strength, power and muscular endurance, through the use of repetitive movements against a resisting load of some kind (Payne, 1990).

Strength Training

Strength training is a systematic programme (or) exercises against some resistance for development of muscular system (Arnheim & Prentice 2000).
Core training

The term core refers to the trunk or more specifically the lumbo pelvic region of the body (*Gill, 2001*).

Core stability as the capacity of the stabilizing system to maintain the inter vertebral neutral zones within physiological limits (*Panjabi, 1993*).

Bio motor ability

Bio motor abilities are components of overall physical fitness (*International Athletic Association Federation, (n.d))

Bio motor Ability means “Life or Movement Skill” (*Marchant, (n.d))

Football

A game, involving two teams of 11 players taking up position in their respective half with the aim of passing the ball between two horizontal bars & under the uprights placed on either side of the field, simultaneously trying to prevent the opponent from scoring goals.

All football players of the both the team (Excluding goal keeper) during play should not deliberately handle the football with their hands or arm. Football players may use their feet to move the football around with the football around with in the football field, Players may use any part of the bodies during play excluding their hands and arms. Within the time duration of play, all players are free to play the ball in any direction and move throughout the pitch, through that ball should not receive in an offside position while football matches (*FIFA, 2007*).
Agility

Agility can be defined as the accuracy and speed with which an individual integrates his body parts in various ways (Cratty & Hutton, 1969).

Balance

Balance is the ability to maintain equilibrium while stationary or moving (Wuest & Bucher, 1992).

Co-ordination

Coordination is the ability to execute movement smoothly and efficiently (Wuest & Bucher, 1992).

Power

Power is the function of force and velocity and it can be defined as the rate of performing work. When express by the formula

\[ \text{Power} = \text{force} \times \text{Velocity} \text{ or work done/ time taken} \]

(Wasco & Gustafon, 1988).

Power is the capacity of the individual to bring into maximum muscular contraction at faster rate of speed (Barrow & McGee, 1973).

Explosive power

The ability of neuro-muscular system to overcome resistance with speed of contraction (Dick, 1980).

The capacity of the leg to release maximum muscular force in the shortest times as in executing a vertical jump (Baumgatner & Jackson, 1987).
Flexibility

Flexibility is defined as the ability to perform movement with greater range of motion or large amplitude (Uppal, 2001).

Muscular endurance

The ability of a muscle to repeat identical movements or pressure or to maintain certain degree of tension over a period of time (Johnson & Nelson, 1986).

Muscular endurance is the ability of a muscle to work against a moderate resistance for long period of time (Johnson & Nelson, 1982).

Muscular strength

Strength system is the greatest force the neuro-muscular system is capable of exerting in a single maximum voluntary contraction. It denotes performance in those events where great resistance has to overcome (Dick et al., 1978).

Speed

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

Systolic blood pressure

Systolic blood pressure is the highest arterial pressures measured during a cardiac cycle. It is the pressure in the artery after blood has been ejected from the left ventricle during systole (Castanzolinda, 1998).

The highest level to which the arterial blood pressure raises during the systolic ejection of blood from the ventricle (Lawrence, 1976).
Diastolic blood pressure

Diastolic blood pressure is the lowest arterial pressure measured during a cardiac and in the artery during ventricular relaxation when no blood is being ejected from the left Ventricle (Castanzolinda, 1998).

Diastolic pressure is the lowest arterial blood pressure of cardiac cycle occurring during diastolic of heart (Reid & Thomson, 1985).

Resting pulse rate

The number of times heart contract in each minute while the body is at rest (Hockey, 1989).

Vo2 Max – (Maximal oxygen uptake)

Vo2 max is the maximal volume of oxygen one can consume during exhaustive work and is measured by slowly and systematically increasing work intensity until exhaustion is reached. (Baumagarther & Jackson, 1987).

Vo2 max is the amount of oxygen used during exercise. Maximum amount of oxygen that a person can take during one minute of exercise (Maglishcho, 2003).

Significance of the study

- The study will enlighten the importance of complex training, core exercise programme and complex training with core exercise programme.
- The result of study would add the quantum of knowledge in the area of physical education and sports in general as well as sports training method and sports physiology in specific.
- This investigation would give basic knowledge to the sports scientist to envisage and conduct further research in various combination of sports strength training.
- The study would be to bring out new and useful combination training for advancement of performance in sports events.
- The study would be helpful to know the effect of Isolated training such as complex training and core exercise programme on selected bio motor ability physiological and skill related performance variables.
- The study would be helpful to know the combined training effect of complex training with core exercise programme on selected bio motor ability physiological and skill related performance variables.
- The study would be useful to physical educationist and sports coaches to analyze which type of training more suitable for executing their performance effectively and efficiently.
- The result of the study would enhance the awareness of training programme among football players participation.