CHAPTER - I

INTRODUCTION

1. INTRODUCTION

1.1. BACKGROUND

Sport has a very prominent role in modern society. It is important to an individual, a group, a nation indeed to the whole world. Sport is an institutionalized competitive activity that involves vigorous physical exertion or the use of relatively complex physical skills by individuals whose participation is motivated by a combination of the intrinsic satisfaction associated with the activity itself and external rewards earned through participation. The essential component of sport is competition, the striving to achieve a prescribed goal. This competition must be under rules and standardized conditions (Howell et al. 1994).¹

The aim of general physical training is to develop major motor abilities such as strength, endurance, speed, agility and flexibility. The means and methods of training should be of both general and specific in order to achieve successful results. In other words, training should be around in nature (Krassilchtchikov, 1997).² Sportsmen undergo various types of training to improve their performance and physical fitness. Training means a systematic and scientific program of conditioning exercise and physical activities designed to improve the physical fitness and skills of players (Fox, 1984).³

Physical fitness is one of the most important factors that determine the performance level of an individual. Sports performance depends largely on physical fitness factors such as strength, speed, endurance, flexibility and various abilities requiring co-ordination. Sports activity is a physical activity which is not possible without these motor abilities. Fitness factors are the most important elements for

predicting athletic performance. Natural ability is the promise of potential but fundamentals are the foundation of excellence (Clarke, 1967).

1.2. SPORTS TRAINING

Sports training systematic process extends over a long period. For best result, the system of training has to be based and conducted on scientific facts and lines where it is not possible to do that, the training has to be based on the results of successful practice which has withstood the test of time sports. Physical training aims at improving the performance of sports persons. The sports performance depends on several factors. The performance of a sports person primarily depends on his capacity, such as speed, strength and endurance. All these factors therefore are the principal aims of physical training. Sport training is a physical, technical, moral and intellectual participation of an athlete with the help of physical exercise. It is a planned process for the participation of an athlete and player, to achieve top level performance. In developing the physical, motor and performance related components in football, basketball, generally the player is treated with varied form of training such as stretching exercise, resistance, plyometric training, interval training, speed based training and combination of different training module of these the training modules used in the present study are explained below briefly.

Depending on the progress in the construction plan, the relative mix of all these materials will vary. As a training season develops, compression conditioning work for endurance will gradually from a transition into an emphasis on power with substitution of intensity of volume in determining the total load (Singh, 1991).

1.3. CONCEPT OF SPORTS TRAINING

Sport training is a basic preparation of sportsman for better performance through physical exercise. It is based on the scientific principles aiming at education, improvement of general health and organic functions as well as increasing the strength and stability of the muscular-skeletal system and enhanced performance. Development of motor skill is also one of the objectives of sports training. Sports

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activities consist of motor movement and action and their success depends largely on how correctly they are performed. Techniques of training and improvement of tactical efficiency play a vital role in training process. It must be understood on a wider sense since physical exercises undoubtedly are the principal means to improve performance. But the sports performance is improved by other means also which should be include the concept of sports training. Such means, which are most commonly used along with physical exercise, are theoretical instruction, discussions, tasks of observations, physiotherapeutic measure for recovery from fatigue, psycho regulative procedure and so on. These means and the physical exercise, actual training process is used in a complex integrated manner. In reality, we cannot separate physical exercise from other means. Hence the concept of sports training must include all the means for the improvement of performance. The sport training therefore is the total process of preparation of a sportsman, through different means and for better performance. Sports performance is the result and expression of the total personality of the sportsman’s physical fitness, technique and tactics. In addition to that, the sportsman must possess certain cognitive, volitional and perceptual activities, certain personality traits, habit and above all positive belief, values, attitude and interest of training competition. Therefore, sport training also aims at better education of the sportsman.

The education aspect of sports training is unfortunately often overlooked by the coaches and physical education teachers in India. Performance improvement is stressed more at the cost of the education of the sportsman.

The pedagogical aspect of sports training comes into sharp focus. When we consider that in performance sports, the systematic training in almost all the sports has to start from childhood. Therefore, it becomes all the more important to educate the child and youth along with improving their performance through sports 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 some of the original movements. Any invariable training implies hard work. Training should be associated with good health. Training is a program of exercise designed to
improve the skills and increase the energy capacities of an athlete for a particular event. (Edward L. 1984)⁶

1.4. WEIGHT TRAINING

Weight Training

Weight Training is a type of Strength Training that uses weights for resistance. Weight training provides a stress to the muscles that causes them to adapt and get stronger, similar to the way aerobic conditioning strengthens your heart. Weight training can be performed with free weights, such as barbells and dumbbells, or by using weight machines. Increase your strength through other types of resistance exercises, such as by using your body weight or resistance bands.

The combined venture of Strength and conditioning training is now an integral part of athletic preparation for all serious athletes and sports teams. However, the issue of hover best to train and prepare for athletic competition is very controversial. Athletes, coaches and exercise scientists debate issues such as volume and frequency of training, choice of exercise and movement cadence. One of the most controversial issues in this field is the use of 'explosive' exercises to increase strength and power. These can be defined as "resistance exercises characterized by maximal or near-maximal rates of force development or by high acceleration". Typical examples of such exercises, commonly prescribed by strength coaches, are Olympic-style lifts such as the clean and jerk and snatch, and derivatives of power clean and hang clean. Also, so-called 'plyometric' exercises defined as "maximal, all out-quality efforts in each repetition of exercise", as well as performing any weight training exercises at a relatively fast cadence, are popularly believed to be effective in enhancing strength, power and the rate of force development. This is based on the fact that muscle fiber composition provides the potential for the neuromuscular system to produce fast speeds, in particular fast twitch fibers. However, the selective recruitment of muscle fiber type is impossible. As such, muscle fibers are recruited by the nervous system in a logical progression according to the force requirements and not the speed of movement. For example, slow twitch fibers meet the demands of low muscular intensity, whereas the fast twitch fibers are eventually recruited when the other fatigue

resistant fibers are exhausted. Therefore slow twitch fibers are recruited first and fast twitch next and there is no definite proof that undertaking explosive tasks will by-pass this process (Bruce, 2007).

1.4.1 Benefit of Weight Training

The benefits of Weight Training in both competitive and recreational athletes. Improvements in muscle strength and power, increase in muscle size, and improvement in sports performance are common benefits resulting from resistance training programs. In addition, resistance training has also been suggested to reduce the risk for musculoskeletal injuries, or perhaps reduce the severity of such injury. Although studies reporting the direct effect of resistance training on injury rate reduction are limited, the physiological adaptations seen consequent to resistance training on bone, connective tissue and muscle does imply enhanced protection against injury for individuals who participate in such a training program. There are innumerable exercises in which the body weight of the sportsman acts as resistance for improving strength i.e., all types of jumps, wall bar exercises for strength, pull-ups, rope climbing, sit-ups, etc. These exercises, if properly done, are very effective for improving explosive strength and strength endurance. Most of these exercises can be done without any equipment. The load intensity in these exercises is automatically related to one's own body weight. In several sports and other cases where weight training equipment is not available and through exercises with one's own body weight as resistance, traditionally applied (Singh, 1991).

Athletes movements, whether voluntary or reflex simple or complex, are the result of muscular contractions which may acts to facilitate the movement (the agonists) or inhibit it (the antagonistic muscles). More complex movements that the athlete has not yet atomized are limited by certain factors, especially a uncoordinated excitation, which might affect the ratio of agonist and antagonist involvement, resulting in uncontrolled and poorly coordinated movements. Regulating the motor activity implies differentiating and reacting to a stimulus with high precision and quickness. As a result of many repetitions of a skill or technical element, the

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fundamental nervous process of excitation and inhibition became properly coordinated, which results in stable, well-coordinated, efficient and fine motor skills. (Goldsmith, 2000)⁹

1.4.2 Physiological Benefit of Weight Training

Effect on Muscle

1. Muscle Response in order to repair damage resulting from conditioning sessions, and thus build a training effect, muscle cells must draw on their energy and nutrient pool. Too many demands on this pool, however, will reduce the ability of the cell to respond. Building training effects in more than one fitness component at the same time (ie concurrent conditioning) could therefore reduce the ability of the cells to respond optimally. The reason why this appears to interfere most with strength conditioning is to do with the different types of muscle fibers used and the time it takes to build the training effect. During aerobic conditioning both slow-twitch (type I) and fast-twitch oxidative (type II a) muscle fibers are recruited. With strength conditioning both fast-twitch oxidative and glycoltic (type II a and II b) fibers are recruited. Since the Effects of moderate aerobic training are experienced primarily in slow-twitch muscle, strength conditioning will interfere to a minimal extent. However, the recruitment of fast-twitch muscle fibers which occurs during prolonged or intense aerobic conditioning can interfere with their ability to build strength. Response to the training stimulus differs greatly between the two modes of conditioning. Aerobic training effects are built 12-24 hours afterwards, while it takes 24-72 hours to build strength adaptations, with the highest rate of building taking place in the first half of this period, then tapering off. Therefore, strength adaptations can be affected over a much longer period of time than aerobic adaptations. In practical terms, this means that athletes engaged in both strength and aerobic training on the same day should leave as long a gap as possible between the two types of training make sure the aerobic conditioning component is of low intensity and moderate duration in order to recruit primarily slow-twitch fibers, and/or make sure the aerobic conditioning involves different muscle groups from those targeted during strength-training. Fatigue Research has suggested that aerobically-induced muscle

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fatigue decreases the quality and quantity of subsequent strength conditioning, displayed as a reduction in the number of reps and/or sets completed. Over a training phase this will have the effect of reducing training load progression and, in consequence, total strength gain during the phase. Both sequencing of conditioning and length of recovery period between sessions are key factors in the extent of fatigue experienced. Since strength training appears to be more susceptible to interference than aerobic training, recovery before strength conditioning is crucial to maximizing its benefits. The potential quantity of strength conditioning that can be performed is reduced for up to eight hours following an aerobic-training session, but only in the specific muscle groups targeted by that training. The potential for ‘interference’ to dilute gains emphasizes the need for a thoughtful approach to developing a conditioning programme, particularly when a building block approach is used to determine the sequence of conditioning sessions over time. Whether the interference effect results from strain on the adaptive processes or fatigue, the solution is to perform the high-intensity work in as rested a state as possible. Training should be scheduled so that high intensity work in similar muscle groups is spaced 24-48 hours apart, 21 with intervening conditioning sessions being low in volume or targeted at different muscle groups. If aerobic conditioning is scheduled before strength training, there should, ideally, be a gap of at least eight hours between the two sessions or use of completely different muscle groups. If aerobic conditioning follows strength work, then it should involve different muscle groups and low work volume. Decreases in muscle mass and subsequent reductions in muscle strength as one ages not only results in a loss of functional ability, but also increases the risk for falls and fractures. Resistance training programs for an aging population have the same benefits for increase in both strength and muscle size as such programs do for the younger and more active population. As functional ability is maintained or improved, the risk for injury is significantly reduced. Resistance training also has an important role in reducing the risk for musculoskeletal injuries related to muscle imbalance, expressed as either an agonist to antagonist ratio (i.e., knee flexors/knee extensors) or as a bilateral comparison (i.e., right and left knee flexors). Correction of the existing imbalance through a resistance training program is important to reducing the individual’s risk for muscle injury. Resistance training programs also have a positive effect on reducing low back injuries. Whether this reduced risk is related to increased strength in the lumbar extensors or to stronger lumbar vertebrae is not known.
However, the benefits of resistance training on reducing back injuries and associated expenses are well acknowledged. The importance of resistance training to sports performance has been supported by studies which have demonstrated that resistance training in the form of weight training and more recently, plyometric training have enhanced some competitive performances. Most typically this has been reported as an improvement in vertical jumping ability. Many studies have reported that resistance training has enhanced muscular strength, but failed to induce changes in dynamic sporting performance (Bloomfield et al., 1994).

**Effect on Bone**

Because bone is living tissue, it has the ability to remodel and adapt to the physical stresses imposed on it. Individuals who are physically active have been shown to have greater bone mineral density than sedentary individuals. In general, physically active persons are at a reduced risk for osteoporosis, fracture or other ailments related to bone deterioration. Although bone will respond to many types of training programs, especially those with high strain such as jumping or running, it does appear that resistance training provides the greatest estrogenic (increase in bone mineral density) effect. Resistance training is beneficial for increasing bone strength, and muscular strength also appears to be positively related to bone mineral content and bone strength. As lower-body strength levels increase, the incidence of stress fracture is reduced. Thus muscular strength improves bone strength as well. However, it is not clear whether the relative improvements in bone and muscle strength during a resistance training program are similar.

**Effect on Connective Tissue**

Connective tissue provides the support or framework of the body. It consists of cells and fibers imbedded in a gel-like material containing tissue fluids and various metabolites. The primary fiber of connective tissue is collagen. Although to date there has been little research conducted on the direct effect of resistance training on connective tissue adaptations, what studies have reported is increases in both the size and strength of ligaments and tendons. Increases in the size of connective tissues are thought to be the result of an increase in the collagen content within the connective tissue.

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tissue sheaths. Although collagen content increases with training, comparisons between untrained individuals and body builders suggest that the increase in collagen content is proportional to the increase in muscle. Body builders seem to have greater absolute collagen content, but relative values are similar to untrained controls. Thus, increases in muscle mass are likely met by increases in the size and strength of the connective tissue Gorostiaga Esteban (1999).  

1.5. Circuit Training

Circuit weigh training has been recommended and has been reported to improve strength, lean body mass, self-efficacy, and may decrease risk factors for coronary artery disease. There appears to be considerable benefit and minimal risk of resistive exercise training for patients with cardio Respiratory impairment. This mode of exercise may allow patients to perform daily strength tasks safely, more efficiently, and with greater self confidence." Studies have concluded that, depending on the structure and balance of the session, one can dramatically improve fitness level by taking part in circuit training exercises. One can significantly improve cardio Respiratory fitness level by exercising in short bursts of approximately 60 seconds each. If one individual follows an aerobic work-station with a high repetition and strength station, individual will sustain a raised heart rate and therefore get the best possible results. It saves time, develops the physical qualities namely strength, endurance by work with upper body and lower body. The benefits of taking part in circuit training can be summed up in a few words: “Maximum results in the minimum time. It is probably one of the best methods of exercising as it provides excellent all round fitness, tone and strength Verill et al, (1992).  

1.5.1. Brief History of Circuit Training

Elements of Circuit-style training programs were present early on in history. The modern form of circuit training was developed by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England. It was initially examined as a

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9 to 12 exercise protocol where participants performed exercises at a moderate intensity (about 40% to 60% of 1 RM values) for a specified number of repetitions or amount of time. Once the repetitions were performed or time expired, the participant would move to the next exercise station with very little rest. Improvements in muscle strength and endurance were observed, as well as components of aerobic fitness. The efficiency of this type of training grew in popularity and expanded because of advances in equipment by the United States (selectorized and hydraulic equipment). For years, a growing body of research expanded on the benefits of this highly efficient mode of training. Researchers have examined how increasing the intensity of this type of training by using exercises known to significantly elevate the Heart rate and limiting rest time could elicit even greater gains in even shorter overall exercise time (4, 5, 10, and 16). Today, using body weight as resistance during circuit training may grow in popularity as financial means to special equipment and facilities. Body weight can provide an adequate training load as long as it results in sufficient aerobic and resistance training intensities. There also may be a greater impact on subcutaneous fat loss with high-intensity intermittent circuit-style resistance training protocols than with traditional steady state sustained-effort aerobic work or traditional resistance training. This is thought to be from the increased level of catecholamine’s and growth hormone found in the blood both during and after high-intensity resistance training exercise with shortened rest periods (G30 seconds) (11, 12). Shorter rest periods result in a shorter total exercise time. This is attractive to individuals who are trying to maximize the impact of an exercise program in minimal time. The Human Performance Institute, Division of Wellness and Prevention, Inc., in Orlando, FL, our clients are high-performing professionals from a variety of industries. These men and women face incessant demands on their time, along with the pressure to perform at high levels and balance their careers and personal lives. From our work with elite performers, we have learned that managing energy is the key to training high performance. However, when facing seemingly infinite demands, one’s ability to man-age and expand physical energy can be severely compromised. This can result in persistent fatigue (physical, but also emotional and mental) and a growing level of disengagement with one’s career, family, friends, and personal well-being, which can ultimately lead to performance failure. Regular aerobic and resistance training are two of the strategies we suggest to help individuals manage and expand their physical energy, prevent fatigue, and sustain engagement in those things that really matter to
them. For either of these exercise strategies to be practical and applicable to the time-constrained client, they must be safe, effective, and efficient. As many of our clients travel frequently, the program also must be able to be performed anywhere, without special equipment. Traditionally, resistance training often is performed separately from aerobic training typically on two or three non-consecutive days each week. The American College of Sports Medicine recommends 8 to 12 repetitions of a resistance training exercise for each major muscle group at an intensity of 40% to 80% of a one repetition max depending on the training level of the participant. Two to three minutes of rest is recommended between exercise sets to allow for proper recovery. Two to four sets are recommended for each muscle group. Standard guidelines for aerobic training recommend 150 minutes per week of moderate-intensity exercise (46% to 63% of maximal oxygen uptake, VO2max) for 30 to 60 minutes per session and/or 75 minutes per week of various intensity exercise (64% to 90% VO2max) for 20 to 60 minutes per session. Although these traditional protocols can be effective, they may not be realistic enough for time conscious adults because of the amount of time necessary to complete each program, in addition to some limitations to effectiveness demonstrated in the literature. To address the limitations of traditional exercise protocols and provide an effective and efficient program for our clients, one of the exercise strategies we use is high-intensity circuit training using body weight as resistance. Our approach combines aerobic and resistance training into a single exercise bout lasting approximately 7 minutes. Participants can repeat the 7-minute bout 2 to 3 times, depending on the amount of time they have. As body weight provides the only form of resistance, the program can be done anywhere Lateef (1979)13.

1.5.2. Circuit Type Weight Training

The development of a powerful upper body is important for basketball players. The need for leg training typically has been obvious with all the running and jumping in this sport. But today’s game, no longer a “non-contact” sport, also requires a strong upper torso. Following are some principles from his experiences in training elite level basketball players like former National Basketball Association three point champ Jim

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Les and current Boston Celtic’s Antonie Walker. Developing upper body strength and power should be an integrated part of a complete training program, as it is important to remember the body functions as a whole on the basketball court. The upper body core and legs all work together to perform total-body movements. Likewise, strength and 21 powers are not expressed independent of coordination, balance, flexibility, etc. The body is an interdependent unit. Before loading complex dynamic movements, first analyze the player for balance of the muscular-skeletal system. According to literature reviews, basketball typically does not develop major imbalances of the upper body. However, basketball players are subject to the common upper body imbalance of round-shouldered syndrome, especially in taller players. This syndrome is due in part to weak muscles, including the rhomboids, middle/lower trapezius, posterior deltoid, external shoulder rotators and the serratus anterior. Exercises to strengthen these muscles include resisted forms of scapular-thoracic retraction, protraction and shoulder flexion, horizontal abduction and external rotation. An ideal tool to train these movements is Life Fitness’ Dual Adjustable Pulley- or any other adjustable selector pulley system. Protraction is also effectively worked from the pushup position on unstable apparatus such as a foam roller. In addition, include training to improve postural movement awareness, lengthen tight muscles and correct other identified imbalances. As upper body balance is developed, more traditional pressing and pulling movements can be performed. Typical pressing movements include dips, bench presses, inclines and overhead presses. Common pulling movements include pull downs, seated rows and upright rowing. Be sure to balance all seated pressing and pulling movements with similar movements in a standing position while using cables, dumbbells and other equipment that requires standing such as hammer strength ground base. This way of training focuses more on total-body coordination and the development of greater stability. In addition, isolation-type exercises to develop shoulder strength should be performed. At the elite level, hand checking, holding a defender at bay and boxing out require a great deal of upper body strength. Variations of shoulder raises to the front, back, side, etc., are performed in different standing positions. Cables are often used with slow contractions through limited range to develop strength specific to the action on the court. In this phase, athletes also can perform a few sets of isolated arm work for biceps and triceps. Isolated movements of the shoulder must become more integrated with the core, hip and total body. Medicine ball work can be added to lightly resist specific basketball
movements. Use of isolated movements is minimized, being used only as needed to strengthen persistent weak links. Upper body strength and power training are important for today’s basketball players and are most effective when exercises are integrated into a comprehensive training plan. Correction of muscular-skeletal imbalances should be emphasized at the beginning of the training programme. A variety of movements should be performed utilizing machines, cables, free weights or other resistance devices. Movements used in training should be chosen with basketball function in mind. Progress the program to dynamic, ground based, total body actions. Here, resistance training should be total-body, feet-on-the-ground, basketball-specific actions. Pushing and pulling movements should now be performed with one hand at a variety of angles. Different functional stances should be used to emphasize total-body action and rotational power in the transverse plane. The periodized resistance exercises involved in circuits encourages muscle mass development and is important for a sound overall exercise programme. The variety of strength training exercises executed in a quick paced rotation through several settings, minimum rest period within the sport of specialization is labeled as circuit training method. Periodized resistance workouts that is circuit based ideally optimizes strength, speed and endurance, which is required at a decent level to meet the demands of the various skills in Basketball and to claim that the player, is in great condition (Garth Fisher, 1979).14

1.6. BASKETBALL

Basketball is one of the most popular games in the world. It is played and watched by more people than any other game, extending to more than 170 countries around the globe. Dr. James Nai Smith is known worldwide as the inventor of basketball stand as the third fastest game played in short court surface. Basketball has gained worldwide popularity and fascinated players and spectators with its dynamic characteristics as a team sport In this sport, players cover about 4500–5000 m during a 40-min game with a variety of multidirectional movements such as running, dribbling, and shuffling at variable velocities In order to execute running, dribbling

and shuffling like movements during performance, both aerobic and anaerobic metabolic systems appear to be involved throughout a game.

Basketball is an athletic game involving its participants in a range of demanding motor skills. These skills vary in kind from, being able to run quickly with precision and good timing on a small, sometimes congested, court area, to, the fine hand-eye co-ordination skills of catching and dribbling, or, shooting, or, passing what appears to be quite a large ball into basket. It also assumes that the players understand and incorporate a set of rules and are prepared to not only play by them, but to cooperate with others in order to achieve the aims associated with the game. Basketball, above all else, is a game about decision making, which implies that its players need to be able to apply their skills in the quickly changing and very variable environment that is the essence of the activity (Jon, 2004).

As a game, agile and explosive event in nature, a player is in need of basic fitness and motor components along with skill based drills to master in the fundamental skill and executed the same in a well defined format. For this, players have been trained with varied physical training module namely stretching exercise, resistance training plyometric and interval training and combination of these and so on, of these plyometric and resistance training are very widely used in the game of basketball. Since it develops the strength and explosive power which are the major determination of the performance of a player in basketball. In this line a player should also be sound in functional flexibility speed, agility and cardio respiratory endurance to excel in performance the fundamental skill since basketball is also a game of agility in nature.

In addition to such strength and power related training, to have the full range of motion in all joints of human body, a player has to treat with very specific stretching exercise which would help them not only to excel in execution of skills but also to be free from sports injuries. Thus the above said physical and motor component, mean while were having the physical ability for achieving the goal is a tedious task. Since the present world of sports is competitive. In high level competition very specifically during the matches between the challenging teams, because of stress, players may have an opportunity to lose their mental toughness, perception ability, concentration and apprehending the follow players moves. As a result of this, players find it difficult in executing the fundamental skill in time which affects the ultimate aim of team. In this situation, when finding the alternative means
and method to develop the physical, mind and game based physical activity concurrently (Jon, 2004).

1.6.1 NATURE OF BASKETBALL

Basketball is a game played with continuous flow of activity and has always been concerned as a game of precision, timing, accuracy and agility. Although only 15% of the playing time in a basketball game has been described as high intensity, these actions are likely to determine the outcome of a contest. Basketball players must have tremendous cardio respiratory endurance to run up and down the court, time after time fun for quarter of play, but he will also need to execute explosive bouts of speed explosive jump and explosive movement for agility time after time such as ability to perform explosively regardless to extreme cardio respiratory fatigue is called “strength endurance”. Basketball is just a game of blowing short and fast breaks. It is a complete game involving incredible level of fitness, having a great intensity throughout entire game. The player can have the ability the faster stronger and more enduring the entire game with the mystery on performance related components a player can have a higher degree of overall body strength and stamina as well as increasing ability to whole position under the basketball, rebound, increase speed and agility. All this might explain why children can get very excited about playing basketball for the first time. There seems so much to do and so much that is possible. The excitement can be contagious, and, if world participation and spectator figures are anything to go by, it appears to endure into the adult population. How all this excitement can be harnessed into an enjoyable introduction to basketball is a challenging prospect for the new coach. Just as James Naismith invented this new game in 1891 in order to achieve with his students the ‘pleasure and thrill of athletic competition, so the new coach might be reminded of what children might expect from being introduced to basketball (Atkins, 2004).

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1.7. STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effect of weight training and circuit training on selected physical and physiological variables of college basketball players.

1.8. OBJECTIVES OF THE STUDY

- The objective of the study was to find out effects of Weight training and Circuit training on selected physical fitness variables and physiological variables of college male Basketball players.
- The objective of the study was to find out superiority of Weight training and Circuit training of college male Basketball players.

1.9. DELIMITATIONS

The present study delimited in the following:

- Players of the present study were delimited to the college men players from Veer Narmad South Gujarat University, Surat, and Gujarat who were the participants twice in inter-collegiate level competition.
- The total number of players was delimited to sixty and each group was consisting of twenty players.
- The age of the selected male Basketball players ranged from 17-25 years
- This study was delimited to variables such as,
  - (a) Physical variables - Speed, Explosive Power, Flexibility, Agility,
  - (b) Physiological variable – Cardio Respiratory Endurance, Resting Pulse Rate, Vital Capacity, Blood Pressure.
- The period of training programme was delimited to six weeks.
- The subjects were assigned at random to one of the three groups, in which the first group (N=20; CT group) performed the Circuit Training, the second one (N=20; WT group) performed the Weight Training and third group was the control group (N=20; CON group).
- The data was collected prior and after 6 weeks of training program.
1.10. LIMITATIONS

The study was limited to the following aspects and these limitations would be taken into consideration of the result.

- The Influence of certain factors like life style, daily routine work, diet and other factors on the results of the study were not taken into consideration.
- Since the players were motivated verbally during testing and training period no attempt was put to differentiate their level of motivation.
- The heredity of the players and its influence on the selected criterion variables were not taken into consideration.
- Psychological factors, food habits, rest period; lifestyle etc. could not be controlled.

1.11. HYPOTHESES

- It was hypothesized that Weight training and Circuit training would significantly improve the selected physical fitness variables (Speed, Explosive power, Agility, flexibility) and physiological variables (Cardio Respiratory endurance, Resting pulse rate, Vital capacity, Blood pressure) of college male Basketball player.
- It was hypothesized that there was significant difference between the effect of weight and circuit training on selected physical fitness variables (Speed, Explosive Power, Agility, Flexibility) and physiological variables (Cardio Respiratory Endurance, Resting Pulse Rate, Vital Capacity, Blood Pressure) of college male Basketball player.

1.12. OPERATIONAL DEFINITIONS OF TERM

Training

“Training is a planned and controlled process in which, for achieving a goal, changes in complex sports motor performance, ability to act and behavior are made through measures of content, methods and organization.” (Singh, 1991).17

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Weight Training

“Weight training is a common type of strength training for developing the strength and size of skeletal muscles. It uses the weight force of gravity to oppose the force generated by muscle through concentric or eccentric contraction.” (Wikipedia)\(^\text{18}\)

Circuit Training

“Circuit training is a method of fitness training that is designed to develop general, all-round physical and cardio respiratory fitness.” (Klika et al., 2013)\(^\text{19}\)

Speed

“Speed is the capacity of moving a limb or part of the body’s lever system or the whole body with the greatest possible velocity.” (Dick, 1992)\(^\text{20}\)

Explosive power

Power may be defined as the capacity of an individual to being into play maximum muscle contraction at the fastest rate of speed.\(^\text{21}\)

Agility

Agility is generally defined as the ability to change direction quickly and effectively while moving, as nearly as possible of full speed.\(^\text{22}\)

Flexibility

“Flexibility is the ability of an individual to move the body and its parts though as white a range of motion possible without endue stain to the articulations and muscle attachment.” (Barrow and gee, 1979)\(^\text{23}\)

\(^\text{18}\) http://en.wikipedia.org/wiki/Weight_Training


Cardio Respiratory Endurance

“Cardio Respiratory endurance also referred to as cardio respiratory endurance and circulatory endurance is a kind of physiological fitness demonstration through an adjustable of the heart and lung to prolonged exertion.” (Fox, 1993)24

Resting Pulse Rate

“Measurement of heart rate when an organism is under physical and mental rest can be termed as resting pulse rate.” (Johnson and Nelson, 1982)25

Vital Capacity

“Vital capacity is the maximal volume of air that can be forcefully exhaled from the lungs following a maximal inspiration. Maximal volume of air forcefully expired after maximal inspiration.” (Stnikic, 1981)26

Blood Pressure

“Pressure that is exerted by the blood upon the walls of the blood vessels and especially arteries and that varies with the muscular efficiency of the heart, the blood volume and viscosity, the age and health of the individual, and the state of the Respiratory wall.” (Silva and Weinberg, 1991)27

1.13. SIGNIFICANCE OF THE STUDY

Physical educationists and sports scientists have been constantly examining sports performance in relation to the individual skill and fitness standards. They try to discover those factors that contribute to high performance so that the finding could be utilized in the practical aspects of coaching and training.

1. To improve the performance of Basketball game, the results of the investigation may be help to formulate the specific training programmes for Basketball players.

2. The findings of the study may be enriching the physical education profession with better insight into methods to enhance dependent variable changes among college male Basketball players.

3. The results of this study may be used to bring out the effective players among the college students.

4. The result of this study may be added to the quantum of knowledge in the areas of training methods, fitness and wellness, exercise, physiology and exercise science.

5. There may be great significance for those who are involved in research in the area of physical education and Basketball coaching.

6. The results of the study may be of immense help for the sports persons in almost all track and field events and for other games as well.

7. It may also help to formulate training protocol for various age groups of male Basketball Players.

8. Research hopes to help future science study by gaining a better training understanding. Advancing training method generally start small, and as more is know it improves more