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Physical activity is as old as human life. In primitive man, never watchful of his toes had to keep himself in a very high physical condition for his survival. By the nature of his daily activities, he built a strong sinewy physique. He was highly competent and in pursuit of excellence in performance had been striving to jump higher and further, to run faster and to demonstrate greater strength and skill their search for daily food involved undesirable dangers. So the primitive man had to be an expert runner, jumper, thrower and climber for his very existence. An ideal man should be strong, healthy, broad minded and active.

In ancient times, physical training was given in the form of hunting or training for warfare. Incidentally physical education was given through physical activities, games and sports. First of all, Greece felt the necessity of imparting proper physical education to its youth and so they have included it in their education program. During the 19th century in the process of systematizing general education in many countries place in their scheme of education.

The human body is a marvel. It is the temple of soul to reach harmony of body, mind and spirit that is why our body must be physically fit. Hence, where there is a sound body there we can ensure a sound mind. The development of sports is essential to our health and keep us physically, mentally and spiritually strong Jyothi Joshi (2007).

In the last few decades sports have gained tremendous popularity all over the globe. The popularity of sports is still increasing as a pace, and one sees that the number of sports held in Olympic Games has been steadily increasing. In addition to Olympics Games indigenous sports have also became popular in each country. Thus,
Sports have become an important social and cultural activity of the modern world which is being given the right place it deserves by the nations and societies. Sports serve vital, social and cultural functions, the importance of which can hardly be exaggerated. Sports help in the all round development of human personality Mark Harries (1994).

Sports is an activity that is governed by a set of rules or customs and often engaged in competitively used by itself, sports commonly refer to activities where the physical capabilities of the competitor are the sole or primary determiner of the outcome (win or lose), but the term is also used to include activities such as where mental activity or equipment quality are major factors. Sports are used as entertainment for the player and the viewer. It has also been proven by experiments that daily exercise increase mental strength and power. Sports and its inherent values such as competition, endeavour and enthusiasm have had a consistent influence on culture in our society Rafiuddin M.D. (2007).

Sports have become an important part of nations is culture as well as other culture throughout the world. Sports pervade society to such an extent that it is has been described by many as a microcosm of society. In other words sports reflect characteristics of society Coakely J.J.(1988).

Sports are about realizing one’s potential keeping people in sports longer are a huge gain for society. Today’s world is a world of computers and spaceships. As civilization advances men’s desire to compete with counterpart also increases. If he want to excel in his chosen field, the result of such desire is possible through scientific discoveries and their applications. The competitive nature of human being is as old as his origin. Competitive sports have developed very rapidly throughout the world in recent years. One of the most exciting and rewarding aspects of life is the experience of going beyond what were once thought to be limitations. As a result of advanced, systematic, scientific and continuous research in the field of physical education and
sports, sportsmen have established new records in every sports activity which was previously considered as impossible.

Now a day’s more and more individuals, particularly boys and girls are attracted by sports activities and increasing the number of nations that are represented in the sports arena. As prevention and curative health measures have become more successful throughout the third world war, millions of teenagers should have a chance to enjoy sports. In today’s age of scientific knowledge man is making rapid progress in all walks of life and it is true in the area of games and sports. Also scientific knowledge has revolutionized the standards of human performance in sports disciplines. The players are now trained on scientific lines and using highly sophisticated technology for top performance in their specific sports with minimum expenditure of energy and time.

Physical exercise is extremely important for maintaining physical fitness including healthy weight; building and maintaining healthy bones, muscles, and joints; promoting physiological well-being; and strengthening the immune system.

It is felt that exercise is the master conditioner for the health and major therapy for ill. Fitness implies a dynamic homeostasis and it develops the ability to respond to life physical, emotional and social ongoing demands. Human have consistently strived to run faster. Throw faster and exhibit greater strength endurance and skill. We are naturally competitive and ambitions for excellence in athletic performance. As a result of practical experience old methods of conditioning though fascinating and rich in tradition have been discarded and replaced by new methods based on insight and understanding. For hundreds of years this evolution towards better methods of conditioning was slow but in recent years the dramatic changes have been taken place to enhance performance in sports.

The sports activities are classified into several areas, such as performance sports, physical education, rehabilitation sports, fitness and leisure sports and
adventure sports. Each area of sports caters to the requirements and demands of a particular section of the society.

The area of performance sports has gained much more publicity and importance than the other areas. Performance can be increased to a great extent only by causing biological adaptations and this is possible only through systematic and scientific training.

Specificity of exercise and overload principle should be followed in order to enhance the functioning efficiency of the various systems of the body Veadmir (1995).

Sports training are a conscious human activity. Also, it is a goal oriented activity. Hence, sports training gives high weight age for studying the nature and genesis of sports performance in training and competition, similarly a large portion of sports training is devoted to the study of performance capacity which further comprises of physical condition, technique, coordinative abilities tactics, physique and psychic factors Haradayal Singh (1991).

According to Edward L. Fox (1984) sports training is a program of exercise designed to improve the skills and increase the energy capacities of an athlete for a particular event. The main components which influence the physical performance of athletes are strength, speed, agility, endurance, power, co-ordination, balance, flexibility and body control. As for as training in various track and field events and games speed, power, endurance and flexibility are considered as most important variables. Physical fitness is a thing which one cannot afford to neglect. It is a major factor that determines the output of a person’s life. Life will be miserable and unsuccessful without good health. The life without physical fitness is like “a ship without radar”. One who is physically fit enjoys robust health and has a fine physique and satisfactory levels of social and emotional adjustments. Fitness represents the capacity to live most vigorously and effectively with one’s only resources.
According to Hockey (1993) physical fitness is the ability to carry out every task with vigor and alertness without undue fatigue and with ample energy to enjoy leisure pursuits and to meet unforeseen emergencies.

Training is a pedagogical process which makes possible achievements of high standard performances without any physical or mental damage through the planned systematic development of certain specific skills, physical capabilities and spiritual qualities and the adaptation of the organism Hardayal Singh (1991).

It is a biological principle that “function builds structure” and “structure decides function Arpad (1996). Science of sports training is relevant not only in performance but equally important for other areas of sports also such as physical-education, rehabilitation, physical fitness and leisure sports. In these areas the training is mainly directed towards the development of fitness and health. Science of sports trainings contributes tremendously towards the achievements of such aims of these areas of sports. The recent trends in the further development of sports science indicate that in the near future the subject matter of sports training will be expanded to include the problems and tasks of training in all the areas of sports and health Karpovich (1965).

It is true that organs and muscles that are used will develop and those are not used will atrophy or disappear. For proper growth and development man needs vigorous exercise. For the need of strengthened muscles it must be overloaded. It is inevitable for a man to have suitable existence, effective and efficiency. In order to withstand the strain in life, man must have had stronger body. Every athlete needs proper strength that enables him for efficient and appreciable performances. Gene Hooks (1974) states “The good big man will always beat the good little man”. The statement would be even truer if it reads “The good strong man will always beat the good weak man.
The strength of a nation mainly depends upon the health of the people. As Swamy Vivekananda said that prosperity of the nation depends on steel nerves, Iron muscles and diamond mind citizens. A healthy child is a brick in the wall of the nation. Generally speaking, performance in games and sports depends on speed, strength, power, agility, cardio respiratory endurance and neuromuscular co-ordination. During play, the large muscles contract and relax to the maximum extent by which the internal organs results in developing agility, speed, cardiovascular endurance, vital capacity and strength. So, exercise is the basic necessity for all individuals to build the physical fitness. In this modern world physical fitness became a necessity of every ones life style. With the rapid development of sports to a highly organized and immensely competitive social phenomenon, there has emerged a clear-cut classification of sports on the basis of goal and intensity of participation namely recreation sports, health conditioning and competitive sports Peter Chrisholea Mc Intosh (1963).

Physical fitness is one for 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 fitness factors are most important for predicting athletic performance.

Natural ability is the promise of potential but fundamentals are the foundation of excellence H . Clark (1987).

The importance of developing good conditioning programs based on the specific physiological demands of each sport is considered a key factor to success (Gillam 1985; Taylor 2003; 2004).

Fitness is very specific to the activity and there are large differences between the levels of fitness required, for instance, a national level player will need to be considerably fitter than a player at a regional level. A sound program is essential to develop fit players. If possible each player must be made responsible for his or her
own training. The program could then be tailored to suit not only the team but the individual as well. The program must be monitored and evaluated and then adjusted to the level of fitness required.

According to Boucher .C (1993) to enhance physiological improvement effectively and to bring about a change, specific exercise and overload must be followed. By undergoing a systematic training at a level above normal, a variety of physiological adaptations take place in the body that makes it function more effectively. Numerous training procedures are in practice to improve each and every physical and motor fitness quality at various levels. The best training program is that which increase the desired quality at a higher rate without causing unwanted effects.

The physical fitness programs and regular exercises is the solution for the present day man’s physical and mental problems. Mental wellness is generally viewed as a positive attribute such that a person can reach enhanced levels of mental health. Regular exercises can result in additional psychological benefits apart from the physical benefits like reduction in mental tension improved sense of well-being, self concept, ability to enjoy leisure, assertiveness and self control James.G. (1999).

Physical exercise is as essential as good, rest and sleep for the maintenance of physical fitness. it is the condition that helps a person look and feel well, carryout his daily duties and responsibilities successfully and yet have enough physical reserves to enjoy his other social, civic, cultural and recreational interests in addition fitness enables him/her to meet unusual or emergency demands.

Intensity refers to the power of rate of doing work is commonly thought of as the pace at which one runs or the explosiveness with which weights are lifted. In endurance events, heart rate is linearly related with physical work capacity and oxygen uptake. If they are to derive any conditioning benefit from the work, athletes must exercise of 70 to 80 percent of their age predicted maximum heart rate, corresponding to 57 to 58 percent of maximum oxygen up take. In the present study
the intensity for endurance training is fixed to 60 to 75 percent of target heart rate of the subjects.

Since the time of the industrial revolution technology has advanced at an astounding rate. From that time to today, there has been remarkable transformation of a basically hard-working and rural-based society into a population of anxious and troubled city dwellers and suburbanites with little or no opportunity for physical activity. There advances in modern technology have enabled our present day society to live a life of relative comfort much of what once required an hour of physical work can now be accomplished in just a few seconds by pushing a button or setting a dial. As a result, more time is available to people to pursue leisure activity. The unfortunate fact, however, is that many of these leisure pursuits are sedentary ones. Although the human body is designed for movement and strenuous physical activity, exercise is not typically a part of the average lifestyle. One cannot expect the human body to function optimally and to remain healthy for extended periods if it is abused, or not used as intended. Thus, physical activity has led to a rise in hypo kinetic diseases.

The prefix hypo means lack of and kinetic refers to movement. Individuals who do not exercise regularly are at greater risk of developing hypo-kinetic diseases such as coronary heart disease, hypertension, hyperlipidemia, obesity and musculoskeletal disorders Pollock & Willmore (1990).

Any physical activity leads to anatomical, physical, physiological, biochemical and psychological changes. The efficiency of a physical activity results from its duration, repetitions (volume), load and velocity (intensity) and the frequency of performance (density) when planning the dynamics of training consider these aspects referred to as the variables of training.

Tudor O. Bompa (1999) said that training is not a recent discovery. In ancient times people systematically trained for military and Olympic endeavors. Today athletes prepare themselves for a goal through training. The word training has been a
part of human language since ancient times. It denotes the process of preparation for some tasks. This process invariable extends to number of days, weeks and even months and years. The term training is popularly used in sports. The objective in training is to cause biological adaptation in order to improve performance in a specific task. In a broad sense, the word adaptation means the adjustment of an organism to its environment. If the environment changes the organism also changes to better survive in the new conditions. In biology adaptation is considered as one of the main future of living species. Physical education or regular physical work is a very powerful stimulus for adaptation Veadmir (1995).

David L. Costil et.al., (1991) says that there are three steps in adaptation process. The first step involves creating the need for more energy. Training must be sufficient in both duration and intensity to accomplish this second step is to provide proper nutrients to build the tissues. The third step is that the athlete must be given enough rest to buildup and at repair the warned out tissue. Finally it will be necessary to increase the duration and intensity of training to create further adaption. Once plateaus occur the first two principles of training viz., over load and progression, over load provides a method for producing adaptation while progression ensures that continuous overload takes place.

According to Willmore (1994) training adaptation takes place when the training load is above normal. Training loads are roughly classified as stimulating retraining and detraining loads, in order to induce the required adaptations. For better adaptation the following principles should be applied.

- An exercise overload must be applied.
- The exercise and training protocol must be specific corresponding to the main sports exercise.
Both exercises and training load (intensity, volume) should vary when load is employed over a long period of time and performance gain decrease (accommodation).

Training program must be adjusted individually to each athlete. It should be remembered that the people are different.

Though a coach is always an artist in arranging a training system, the sport science is the underlying foundation for successful training program. An overview of training science basics is the best starting point for every coach who wants to be successful.

Improvement of performance is a direct result of the amount and quality of work achieved in training from the initiation stage right up to the elite performance stage. Workload in training has to be increased gradually, in accordance with each individual’s physical and physiological abilities Tudor O.Bompa (1996).

The word training means different thing in different fields. In sports the work “training” is generally understood to be synonyms of doing physical exercises. In a narrow sense training is doing physical exercise for the improvement of performance.

According to Hrdayal Singh (1984) sports training are process of preparation of sportsmen, based on scientific and pedagogical principles for higher performance. Training results in a more efficient organism. Since a grater efficiency of heart action enables a larger flow of blood to reach the muscle and that ensures an increased supply of fuel and oxygen, more work is performed at less cost. Thus improvement in strength, power, neuromuscular co-ordination endurance, better co-ordination, timing of movements and an improved state of physical fitness can be achieved.

All training responses result in stress and adaptation. A stress is placed on the system and the body adapts to it. If the stress is not too intense, the adaptation will
result in the body being stronger than before. Several important factors should be kept in mind before training the individual. The adaptation should be specific to the stress, adaptation takes place during recovery and if the stress is too intense and too frequent, adaptation is not possible, this is often called ‘failing adaptation’ and it negatively influence on sports performance.

Sports training is an educational process. It aims at improving the sports performances as well as education of sportsmen. It presents unlimited possibilities of giving tasks of different nature emotional elements normally present in sports situations lead to high quality of activities to tackle the tasks. Tasks involving elements of risk and injury are essential for developing fortitude and fearlessness. Tasks involving competitions, formal or informal help in improving tactical thinking, confidence and self-control etc., the major objective of training is to cause biological adaptations to improve performance in a specific task. This requires adherence to carefully planned and executed activities.

The basic principles of any physical training demands that the work intensity may be maximal and it should gradually increase as the individual’s fitness level improve during the course of the conditioning program. The training program should be specific to develop the predominant energy systems involved but also the specific muscle group as well as the specific movement patterns involved. Besides, an individual responds in different ways to identical stimuli hence, training programs must be structured to meet the individual differences and it must also develop the specific muscle or muscle group as well as the specific movement patterns involved in the activity.

In addition to it, one must follow the progressive overload principle. To the development aerobic and anaerobic endurance one must accomplishes more work during each of the training sessions that can be normally accomplished. Overtraining is defined as an increase in training volume and/or intensity of exercise resulting in
performance decrements. Recovery from this condition often requires many weeks or months. A shorter or less severe variations of overtraining is referred to as overreaching, which is easily recovered from in just a few days. Many structured training programs utilize phases of overreaching to provide variety of the training stimulus. Much of the scientific literature on overtraining is based on aerobic activities, despite the fact that resistance exercise is a large component of many exercise programs.

There are various methods of sports training activities for the sportsmen, if carried out they will help them to perform better. In training there are different sets of methods of conditioning such as methods of technique, training methods of tactical training and methods of intellectual development. Training can be done in many ways among them endurance training plays a vital role.

Physical conditioning or training results in a number of changes within the body. Similarly endurance exercise produces great changes in the cardiovascular and respiratory systems but has relatively little effect on muscle strength. Training changes are specific to the activity being pursued and also dependents on the frequency and intensity of participation.

Doughal et.al., (1985) said dynamic and static exercise present different types of stress on the heart of the individual. Static training on the other hand attempts to increase against an increased after load arterial blood pressure (systolic/diastolic) during exercise of body builders. In response to increased work demand the heart weight volume, left ventricle wall thickness and chamber size all increase as a result of endurance training. Cardiac muscle like skeletal muscle undergoes hypertrophy as a result of chronic endurance training. Cardiac hypertrophy induced by exercise is called athlete’s heart.

According to Willmore.J.H. et.al., (1996) the heart rate can decrease markedly by as a result of training. In sedentary individuals the resting heart rate would be 80 beats per minute, resting heart rate decreased by approximately 1 beat
per minute each week for the first ten weeks of training. So after 10 weeks of moderate endurance training resting heart rate could drop from 80 to 70 beats per minute.

During sub maximal exercise, greater aerobic conditioning results in proportionally lower heart rate at a specified rate of work. Six months of endurance training program of moderate intensity decrease in heart rate of 20 to 40 beats per minute are common at the same standardized sub maximal rate of work. These decreases indicate that the heart become more efficient through training.

According to Wilmore, J.H. et.al., (1994) & Pollock et.al., (1978) the duration and frequency of exercise also need to be progressively increased as the individual becomes more tolerant of exercise stress, for basic cardiovascular endurance fitness, the duration of exercise should be 15 to 60 minutes and should be performed 3 to 5 days – walking, running, bicycling, cross country, skipping and swimming are the best cardiovascular conditions.

A physically fit heart beats at a lower rate and pumps more blood per beat at rest. As a result of regular exercise and individual’s capacity to use oxygen is increased substantially. To develop and maintain physical fitness vigorous effort by the individual is required. Physical fitness is considered as one of the most valuable assets and it has received a top priority in all thoughts and actions. Modern coaches devote their time in coaching during pre-seasons mainly for ensuring speed strength and endurance. These can be improved by training.

Different activities make different demands upon the organism with respect to the circulatory, respiratory, metabolic, and neurological and temperature regulating function in specific activity. The training effects are of various kinds and may be observed throughout the body. Apart from various changes, which occur at the tissue level, many systematic changes also occur and these affect primarily on the circulatory and respiratory systems.
The cardiovascular system is responsible for numerous functions in the body, which are essential for survival. The body depends on the cardiovascular system to provide nutrients and remove waste products from every cell in the body to provide a means of cooling the body when it is overheated as a result of exercise or environmental temperature to control the degree of acidity and alkalinity of the body and it provides resistance when disease producing organisms invade the body. Any system of circulation requires three essential components namely a pump, a system of channels or vessels and a fluid medium. The heart, blood vessels and blood respectively comprise the essential components of the cardiovascular system.

A number of specific training methods exist for developing cardiovascular efficacy. The two major classifications of training systems are interval training and continuous training. Interval training involves a period of high intensity work with rest period involved between work outs. Continuous training involves continuous activity without rest intervals. This type of training can be of high intensity or of moderate intensity at an extended duration. Adequate cardiovascular conditioning must be the foundation of any athlete’s general conditioning program. “An athlete is only as good as his heart” the ability of the individual or the athlete to perform work depends in large measure on the ability of the heart to supply the muscles with oxygen. This in turn depends upon two factors. One is the capacity of the heart to pump sufficient blood to meet the demands of exertion, and second is the ability of the heart to return promptly to its resting pulse rate.

Echer (1975) is of the opinion that speed is the product of two factors: stride length and stride frequency. From training point view it appears that the stride length can be increased by increasing the leg strength. Stride frequency however is an inborn quality. Although it might be possible to improve stride frequency slightly through training, it appears that this improvement also brings about a corresponding shortening of stride length.
According to Gene Hooks (1974) strength is the key to success in sports and games. The value of strength in athletics is not a new idea. There is a vast need for everyone involved in sports for a better understanding of strength. Most coaches recognize that strength is a valuable asset to athletic success. “Strength is the capacity of muscles to exert force against resistance. Strength in the form of explosive power is used more in sports and games competitions.

Power represents the one component of athletic fitness that may be most indicative of success in sports, requiring extreme and rapid force production. Explosive power can be increased either by increasing the amount of work or by decreasing the amount of time. Endurance is another important variable which influences the physical performance of an athlete just like speed and power. Endurance in different forms (aerobic endurance, strength endurance etc.) are necessary for prolonged physical activity.

Tudor O. Bompa (1999) strength will always be important as a base. It can be seen that strength is definitely important, but power and speed are more important than any other qualities. Power represents as one of the improvement of athletic fitness that may be indicative of sciences in sports requiring extreme and rapid force production. Most physical movements incorporate the elements of force, quickness, duration, complexity and range of motion to a certain extent, further it can distinguish individual motor aspects and physiological components, such as strength, speed, endurance and co-ordination.

The ability of an individual to perform an exercise is the cause, and the movement itself is just the effect. The athlete requires is the ability to control the cause to perform a successful effect. The bio motor abilities, which are the foundations of a cause are largely genetic or inherited abilities.

Speed is essential for many physical activities. Without speed there is no sport and physical education. Speed of muscle contraction is an innate quality, but speed of
movement can be gained through movement. Speed is a valuable factor in games like football, basketball, hockey and track events. Strength is highly related to speed generally the higher team wins because it is the fastest team.

Training prolongs a drop (which indicates hearing exhaustion) in systolic pressure during heavy work in order that work can continue longer than it might normally would be able to do. The blood pressure recovery process is also improved. That is, the better the trained person in sooner blood pressure returns to the pre-exercise level. Blood pressure is also used as a guide to the efficiency of the heart and blood vessels. Normal value is 120 mm Hg/80 mm Hg. This means at systole (i.e. when the heart thrusts its contents from the left ventricle into the artery which takes the oxygen rich blood to the tissues) the pressure is 120 mm Hg and at diastole (i.e. when the left ventricle is being refilled) the pressure is 80 mm Hg. These pressures rise during exercise. Other blood pressures of interest are those of systole and diastole at the right ventricle which sends oxygen depleted blood along the pulmonary artery to the lungs. These pressures are 25 mm Hg and 7 mm Hg.

Besides exercise and training, several other variables such as age, sex, posture and emotion affect blood pressure. The training must be geared to provide sufficient cardiovascular overload to stimulate increase in stroke volume and cardiac output. Brief limits of repeated exercise as well as continuous long-duration work enhance aerobic capacity, provided the exercise is sufficiently intense to overload the aerobic system. Respiratory effects in general in most of the “lung volumes” (e.g. inspiratory and expiratory reserve volumes, residual volume, total lung volume and vital capacity) are longer in athletes than in non athletes of the same sex and body size. These changes may be a result of an increase in the strength of skeletal muscles responsible for ventilations. Whatever be the cause, it should be pointed out that there is little correction between athletic performance and lung volumes.
To improve cardio-respiratory endurance, either continuous or discontinuous training methods may be used. One of the most commonly used continuous methods is jogging, running and long, circuit training are all forms of intermittent or discontinuous training. Alternate pace methods are more strenuous. In this method, the sports man works continuously but with changing pace. The change of pace is done according to a plan already prepared. For example in continuous running the pace can be varied from slow jogging to sprinting. After a period of running at high-speed the period of slow running follows. The intensity varies from slow to maximum (i.e. 140-180 bpm). The duration of the activity can be 20 minutes to 90 minutes or even more. The pace can be changes in terms of time or distance as is suitable.

Research indicates that interval training, continuous training and fartlek training are three common methods to improve aerobic or cardio respiratory fitness. Compare with other training methods alternate pace method is used very less by the fitness trainers and coaches that is why the researcher has shifted his attention to this aspect of endurance, which however has not been explored or studied so far, this training is a combination of aerobic and anaerobic endurance accomplished in a varied pace run by interrupting steady continuous running with occasional fast run or short sprints. This method is most applicable to field games.

The recent changes in conditioning methods based on careful observation and scientific research. The procedures have produced a vital and precise information about the relative effectiveness of different training methods as a result we currently know much more than ever before about the functioning of the body systems during training and competition and how to develop strength, and endurance, power, agility speed and athletic skills. In recent years we have gained new knowledge in almost every aspect of conditioning and performance.
Being developing nation young athletes do not get enough exposure in international sports competitions. Injury makes an abrupt ending in many talented athletes. This is caused by use of improper training methods or lack of sports facilities. Apart from this when an athlete is injured, he does not get proper medical aid for rehabilitation because of underdevelopment of sports medicine in India. This intensifies. The long term planning in training is a must to achieve better results.

When designing a training program one must consider the interaction among individual training procedures and must consider the training process in relation to the athlete’s overall life situation. An optimum training program is one which is conducted in accordance with certain general principles. To meet the needs of the individual athletes in the best possible manner these principles also serve as guideline in long term planning and can provide a basis for modifying training programs when unexpected circumstances arise.

The General principle of training that should be kept in mind when constructing a training program are (1) overload (2) consistency (3) specificity (4) progression (5) individuality (6) state of training (there should be separate training programs for beginners and well trained) (7) periodigation.

The athletes get burned out in the early stages itself because of unscientific training in India the conventional training program is not producing the desired results. The present training concept should be revised to produce better results. So the researcher made an attempt in the area of training. In the conventional training method, the training load is increased progressively (i.e. the load is increased week by week or a certain period by period) here the training load means an additional functional activity of the organism (relative to the level of rest or other initial level), introduced by the performance of training exercises and the degree of difficulties which are being overcome in the process. According to existing notion, the volume of a training load derives from its intensity and volume. They may be simultaneously
increased only to a certain limit, beyond which further increase of intensity will lead to a decrease in volume and vice-versa. Hence, the necessity to take into accounts the parameters of the volume and intensity of the load **Hardayal Singh (1991).**

Numerous training procedures are in practice to improve each and every physical and motor fitness quality at various levels. These basic training procedures will serve better when utilized with modifications suited to the individual or a group dealt with the best training program is that which increases the defined quality at a higher rate without causing unwanted effects. Today more and more people are becoming interested in outdoor activities and sports. However, the participation in these activities requires an appropriate level of physical fitness beyond the needed one for complete enjoyment in everyday life **Kirkley & John good (1976).**

Intensity of training must be individualized and relative to the requirements of the event and fitness of the athlete. A warm-up for an athlete may be a very intense workout for another. The intensity must not be so high that recovery cannot take place before the next workout period. The intensity, frequency and duration of workouts must match the capabilities of the athlete. Some very intense workouts such as strength training or intense running may require more than twenty four hour of recovery time. Thus alternate workouts, of mixing hard and easy days are important factors in proper recovery.

According to **H Clarke (1976)** the efficiency of an individual in performing physical activities depends basically on his/her cardio-respiratory adjustments and training results in improvement of cardio-respiratory efficiency through training. The efficiency of the circulatory and respiratory systems is improved and resting as well as exercise blood pressure values are lower.

The cardio-respiratory endurance is characterized by moderate contractions of large groups of muscles for relatively long periods of time, during which maximum adjustments of the cardio-respiratory adjustments are necessary as in sustained
running, swimming, climbing and bicycling etc. During training the physiological variables namely oxygen–up take, pulse rate, vital capacity, blood pressure, muscle strength and endurance are affected.

**Charles A. Bucher (1983)** cardiovascular function, the first physical fitness component is regarded by fitness experts as the most important of the fitness qualities particularly in the area of health–related physical fitness. The vigorous physical activity improves cardio-respiratory functions and thus reduces the incidence of cardiovascular disease the kind of endurance associated with cardio-respiratory system is characterized by a physiological fitness. The adjustment in the heart, lungs and circulatory systems just mentioned can be made more efficient through training; the best tests to measure this facet of motor performance are distance running and treadmill run. The fit individual has a cardio-respiratory system which is capable of meeting the demand of the tissues under conditions of intense exercise. Sports have great importance in human life. In the past no importance was attached to sports in the county. But now it is realized that sports are very useful. So, every educational institution of the country provides sports for all, as a matter of fact, sports are in necessary part of education. Sports teach many qualities for the students. When they take part in sports, they have to obey some rules. So, sports teach discipline, which is very useful in practical life.

**Haradayal Singh (1991)** points out the positive effect of endurance activity on various physiological systems that is cardio respiratory, digestion and metabolism. He also states that these activities have a preventive and curative effect on a number of health problems. Resisting heart rate, resting respiratory rate and cardiovascular endurance are certain parameters or external signs of human health and physical fitness.

The training methods to achieve this kind of strength are not new. They have been used for years by jumpers, throwers and more recently by sprinters and hurdles
in track and field. Explosive ballistic work was done out of necessity because their performance arena demands the highest expression of explosive movement with maximal velocity Hardayal Singh (1991).

**Intensity of Training**

Intensity, the qualitative component of work an athlete performs in a given time, is also an important component of training. The more work the athlete performs per unit of time, the higher the intensity. Intensity is a function of the strength of the more impulses the athlete employs in training. The strength of a stimulus depends upon the load, speed of performance and the variation of intervals or rest between repetitions, muscular work and central nervous system involvement through maximum concentration. Intensity varies according to the specificity of the sports, because the level of intensity varies in most sports and games. It is important to establish and use varying degrees of intensity in training. The several methods are available to measure the strength of the stimuli and thus the intensity Tudor O. Bompa (1999).

During training athletes experience various levels of intensity the body adapts by increasing physiological function to meet the training demand. To develop certain bio motor abilities the intensity of stimulus must reach or exceed a threshold level beyond which significant training gains take place, low level loads in training leads to slow development, but ensure sufficient adaptation and consistency of performance. High intensity exercise result in quick progress, but lead to less stable adaptation and lower degree of consistency, using only intensive exercises is not the most effective way to training and alternating training volume and intensity is necessary. The high volume of training is essential to enhance performance consistency Tudor O. Bompa (1999). The key understanding the fundamentals of training program design is realizing the need to integrate all the components of a total fitness program into a balanced year–long program designed especially for each
athlete’s sport. A way to visualize a periodization plan that provides the maximum benefits to each athlete will look much like steps or stairs where the athlete’s work load increased in manageable increments or steps up, than decreases or steps down slightly, as the athlete recovers and prepare for the next steps up.

Tudor O. Bompa (1999) a high level of performance is the result of many years of well-planned, methodical and hard training during this time the athlete tries to adapt his organs and functions to the specific requirements of the chosen sports. The adaptation level is related by performance capabilities. The greater the degree of adaptation, better the performance training adaptation is the sum of transformations brought about by systematically repeated exercises. These structural and physiological changes result from a specific demand that athletes place on their bodies by the activity then purpose depending on the volume, intensity and frequency of training. Physical training is beneficial only as long as it forces the body to adapt to the stress of the effort.

**Resistance Training (RT)**

According to Frank W. Dick (1980) the athletes express force through the body’s lever system by converting chemical to kinetic energy and by neuromuscular coordination. In all physical activities the athletes express this force against external force (resistance). Resistance may take the shape of weights, throwing implements, water, air, the athletes own body weight, momentum and so on.

Gary Moran & Georgy Mc Glynn (1990) revealed that RT is an exercise program where force or stationary weights are used for the purpose of increasing muscular strength, muscular endurance and power through which skill can be improved.
Principles of Resistance Training

The main characteristic of sports training is the organization of training sessions concomitant with the general and special principles of the pedagogical character Matheyev (1981).

According to Riley (Ed) Resistance Training principles are as follows:

- Resistance Training must be progressive and should constantly attempt to increase the repetitions or resistance in every workout.
- The building of strength is related to the intensity of exercise the higher the intensity better the muscles are stimulated.
- Each repetition should be performed with special attention given to a slow speed of movement, a great range of movement and pre-stretching of the involved muscles.
- Resistance exercise should be selected in such a way to involve the greatest Range of movement of the major muscle group.
- All workouts should begin with the largest muscular groups and proceed down to the smallest.

All the fore mentioned principles have their own sub principles also.

Endurance Training (ET)

Endurance is a term that describes two separate but related concepts: muscular endurance and cardio respiratory endurance. Each makes a unique contribution to athletic performance, so each differs in importance to different athletes.

A great deal of information exists regarding the effects and prescription of endurance exercise. The ability to prescribe aerobic exercise is necessary to address
the cardiovascular endurance requirements of a conditioning program. Such aerobic endurance programs can be either continuous or intermittent.

According to American College of Sports Medicine, persons of any age may significantly increase their habitual levels of physical activity safely if there are no contraindications to exercise and a rational program is developed. It is very important that each individual is prescribed the proper intensity, duration and frequency of exercise in progressive manner.

The prescription of aerobic exercise intensity should be individualized based on a stress test if possible. It provides very specific training data for elite athletes. The intensity of the exercise can be related to heart rate value. A training heart rate zone for the aerobic exercise stimulus is typically prescribed. An individual then performs steady state exercise within the training zone.

Raglan J.S. and Willson (2000) it is commonly accepted that success in endurance sports is largely dependent on a successful early season training period in which athletes trains at a significantly greater volume that the amount required for physical fitness. This purposeful elevating of training volume for the specific intent of enhancing athletic performance Morgan W.P. (1987) believed that over training leads to improve endurance performance through a complex interaction of various neurological, cardiovascular, biochemical and muscular adaptations Bob O’ Connor (1997).

Load

In Resistance Training load refers to the mass or amount of weight or resistance utilized for a specific resistance exercise is probably the most important parameter in Resistance Training. The percentage of one repetition (1RM) is one of the best methods to determine the load Tudor O. Bompa (1999).
Anderson .T (1982) found that as the number of repetitions increased, the return on strength gain decreased and local muscular endurance was enhanced. Thus heavier loads (6-8 RM) produced much longer gains in strength than higher loads.

**Overload Principle**

Edward L. Fox and Mathews (1981) revealed that the physiological principle on which strength development depends is known as the overload principle. These principles states that strength will increase only when the muscle performs against a greater resistance than existing before. If the Resistance Training program lost for several weeks or months the body gradually adapts and the training is felt easier.

**Concurrent Strength and Endurance Training**

According to Steven .J. Fleck & Williams . J (1997) training is specific. The body attempts to adapt to the imposed demands. The understanding of the exercise training compatibility has focused on both endurance training and strength training performed together.

Studies examining concurrent training using high level of training for endurance and strength present the following conclusions.

- Strength can be compromised, especially in high velocity muscle action, by the performance of high-intensity endurance training.
- Power capabilities may be compromised by the performance of both strength and Endurance Training.
- Anaerobic performance may be negatively affected by high intensity endurance training.
- Development of Vo2 max is not compromised when concurrent strength and Endurance Training are performed.
Endurance capabilities are not negatively affected by concurrent strength and Endurance Training.

Compatibility of Resistance Training and Endurance Training

Dudley G.A (1985) reveals that combined resistance and endurance activities appears to interpreter primarily with strong performance at high velocities of movement. When strength and Endurance Training are alone in excess, maximal power performance is blunted. Possible explanations for this less than optimal strength and power development include adverse neural changes and the alterations of muscle proteins in the fibers. In contrast no adverse effects on aerobic power have yet been observed, despite the expected cellular changes caused by heavy resistance exercise.

Fletcher G.F. et.al., (1996) felt that during recent decades there has been an increasing consciousness of physical fitness among individuals of all ages. Furthermore several groups of national experts have recently emphasized the benefits of regular exercise for cardiovascular fitness and health.

According to Vivian H. Heyward (1991) one cannot expect the human body to function optimally and to remain healthy for extended periods, if it is abused or not used as intended. Thus physical inactivity has led to raise hypo-kinetic diseases to individuals. The best defense against the developing risk is to put the muscles, bones, heart, lungs and other internal organs to work on all regular basis through a systematic program of exercise.

STATEMENT OF THE PROBLEM

The primary purpose of the present study is designed to examine the “Effect of Resistance Training and Endurance Training in Series and Parallel on selected physical and physiological variables among women”, and it also examines the better program to develop the selected physical and physiological parameters.
OBJECTIVES OF THE STUDY

➢ To review the related literatures on selected topic.
➢ The primary objective of the study is to investigate on the effect of resistance training and endurance training in series and parallel on selected criterion variables.
➢ The study the significance difference between pre and post test values among women.
➢ To examine which training method is good to bring a significant change on selected criterion variables.
➢ To study the changes occur in physical and physiological variables due to the application of resistance training and endurance training in series and parallel training method as compared to control group.

HYPOTHESES

It has been scientifically accepted that any systematic training over a continuous period of time would lead to produce changes in athletic qualities. Based on this concept, the following hypotheses are drawn.

1. There would be a significant improvement in selected physical and physiological parameters due to Resistance training and Endurance training for both experimental groups as compared to the control group.

2. There would be a significant difference in selected physical and physiological parameters for series group and parallel group.
DELIMITATIONS

The Study was delimited in the following factors.

1. For the purpose of the study, 45 women students from K.V.R. College, Nandigama, Krishna Dist, Andhra Pradesh, India were selected as subjects during the academic year 20014-20015.

2. The subjects were assigned at random into three groups of fifteen each (n = 15). Group I underwent series training, Group II underwent parallel training and Group III acted as control.

3. The study was restricted to two methods of training and they were designed as series training and parallel training. Series training group would undergo resistance training followed by endurance training, parallel training group would undergo resistance training and endurance training alternately.

4. The age of the subjects ranged between 19 and 22 years and all of them were healthy and normal.

5. The criterion variables selected for the study were

**Physical Variables:**

a. speed
b. Explosive power (Horizontal)
c. Cardio Respiratory Endurance

**Physiological Variables:**

a. Heart rate at rest (beats/minute)
b. Resting Respiratory Rate (No/min)
c. Systolic blood pressure at rest (SBP) (mm/Hg)
d. Diastolic blood pressure at rest (mm/Hg)
6. The data were collected at two days prior to and immediately after the experimental period.

7. The duration of the experimental period was restricted to 12 weeks and the number of sessions per week confined to four.

**LIMITATIONS**

The following uncontrollable factor were associated with the study was accounted as limitations.

1. The subjects chosen for the study, participated in physical activities, outside the training program could not be controlled.

2. Previous training in sports and games were not taken into consideration. This was also recognized as a limitation.

3. No special motivation techniques were used during testing and training. Therefore the differences that occurred in performance due to the lack of motivation were recognized as a limitation for the study.

4. Even though the subjects stayed in the hostel, the investigator did not put any effort to control or assess the quality and quantity of food ingested separately for each individual.

5. Factors such as rest, body position, activity and emotional changes may alter heart rate and blood pressure, which were considered as limitations of the study, and no attempt was made to control these factors.

6. The quantum of physical exertion, life style and physiological stress and other factors that affects the metabolic functions was also considered as limitations.
OPERATIONAL DEFINITIONS

Training

Training is defined as systematic process of repetitive progressive of work, involving the learning process and acclimatization Daniel .D. and Arnhein (1985).

Training an organized program of exercise designed to stimulate chronic adaptations Robert et al. (2000).

Series

Arrangement of different training methods in succession or in order KRS Reddy (2009).

Series Training

In this study series training denotes resistance training for first six weeks followed by endurance training for another six weeks KRS Reddy (2009).

Parallel

Arrangement of different training methods systematically in alternate sessions KRS Reddy (2009).

Parallel Training

In this study parallel training denotes resistance training and endurance training in alternate sessions for 12 weeks KRS Reddy (2009).

Resistance Training

According to Howard Payne (1990) 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 resting load of some kind.
According to Anita Bean (1997) resistance training refers to strength training performed primarily to enhance a person’s appearance, symmetry and well being.

**Endurance**

According to Hardayal Singh (1991) endurance is the ability which enables to do a sport activity without getting tired and to recover quickly from fatigue during and after activity.

Endurance is the maximum duration an individual can maintain a specific activity Mickel Kent (1994).

**Speed**

Speed may be defined as “the rate at which a person can propel his body or parts of his body through space” Barry L. Johnson & Jack Nelson (1988).

The capacity of moving a limb or part of the body’s lever system or the whole body with the greatest possible velocity Frank W. Dick (1980).

**Explosive Power**

The ability to expand energy in one explosive act or in a series as far as possible. Michael Kent (1998).

It is the ability of neuromuscular system to overcome resistance with a high speed of contraction is defined as explosive power Frank W.Dick (1980).

**Cardio respiratory Endurance**

Cardio respiratory endurance is the ability of the heart, lungs and circulatory system to supply oxygen and nutrients to the working muscles efficiently Heyward (1984).
It is defined as the ability of the body to sustain prolonged exercise Costil (2004).

**Heart rate at rest (HRR)**

The number of times heart contracts and relaxes in each minute while the body is at rest Robert. V. Hockey (1993).

The number of beats while at rest felt in exactly one minute is the resting pulse rate. It was assessed on the lateral side (radial artery) of the forearm Frank W. Dick et al., (1976).

**Blood Pressure**

Arterial blood pressure is defined as the lateral pressure exerted by the contained column of blood on the wall of arteries. The pressure is exerted when the blood flows through the arteries Sembulingam and Prema Sembulingam (2002).

Blood pressure is the measure of the force the heart needs to push blood through the body. Blood pressure is the resistance of the blood against the artery walls Garry et al., (2000).

**Systolic Blood Pressure**

The highest level to which the arterial blood pressure rises during the systolic ejection of blood from the ventricle. When the blood is ejected into the aorta and other arteries during ventricular systole, the pressure increase to maximum called systolic blood pressure Lawrence (1976).

Systolic pressure is the highest arterial pressure measured during a cardiac cycle. It is the pressure in the artery after blood has been ejected from the left ventricle during systole Castanzo Linda (1998).
**Diastolic Blood Pressure**

The lowest level to which the arterial blood pressure falls in the interval between successive heart beats. As the blood drains from the arterioles during ventricular diastole the pressure decreases to a minimum called diastolic blood pressure Lawrence (1976).

Diastolic pressure is the lowest arterial pressure measured during a cardiac cycle and in the artery during ventricular relaxation when no blood is being ejected from the ventricle Castanzo Linda (1998).

**SIGNIFICANCE OF THE STUDY**

1. The findings of this study may add to the existing fund of knowledge with regard to the resistance training and endurance training in series and parallel on selected physical and physiological parameters.

2. The findings of the study add to the body knowledge in the area of sports medicine and exercise physiology.

3. The study would provide scientific base and guidance to the coaches, physical fitness trainers, physical educationists and athletes to identify the best method of training suited to develop physical and physiological variables.

4. The study would provide quantum of knowledge to the reader to understand whether the improvement in cardiovascular parameters is due to the development of strength and endurance separately or simultaneously.

5. The contribution of the study would bring out new and useful training means and methods for the advancement of performance in the field of sports and games.