CHAPTER-1
INTRODUCTION

On The Spears of the game and sports athletics is given the highest position. It is regarded as the father of all games and sports. Because, if we analysis the movements of any particular game of sports, we find the elements of atheism i.e. running, jumping or throwing etc. on the other hand from the primitive age human civilization we find this activities, if we go through the history. In this era human being used to depend on natural sources. As they were not civilized and living in forest consequently they learn to run and jump to get reed of the wild animals and the used of throwing store and sharp wooden sticks towards the animal for hunting purpose and defense. Since those days to recent time it is being developed as sports events progressively.

As history has proved that the Olympic (Ancient) were started in 776 B.C. the events, which were conduct, were the athletic events. The world “Athletic” has been derived from the Greek word “Athalon” which means the “Competition”.

In the modern age of scientific knowledge, man is making repaid progress in all walks of life including that the sports and games. The progress in sports and games may be attributed to the scientific investigation for the better performance of sports man and women, improved scientific and specific training methods and also to the better understanding of the human organism.
Scientific research in the field of physical education is a boon to the athletics trainers and coaches. Physical Education Scientists have been trying to attain higher levels of performance in sports and games.

Human life is a complex of physical, intellectual, emotional and social development patterns, sports and physical activities are integral parts of these patterns. People compete in sports because of the opportunity provided to evaluate their competence in people of all levels of ability with the opportunity to seek out the reinforcements attractive to them and gain certain measures of self evaluation.

Now a days in athletics the sprint events are being proved as the most popular and glamorous event, particularly the 100 mtrs. The sprint events are divided into two types.

1. Short sprint.

2. Long sprint.

The short sprints are the 100m. run, as it is the shortest distance running events in Athletics. The sprint is the event of 400m. the distance of 200m. is some time considered as the intermediate sprints.

Today, sports and physical education are considered as a great force contributing to international understanding and universal brotherhood. In the present politically conflicting times, the sports are also considered as one of the major adhesive forces in developing world peace.
Therefore, stresses on the promotion of physical education and sports from pre-schools to old age should be treated as one of the fundamental human right by national government.

Winning laurels at international sports arena have become a prestige issue linked with political system and as such nations vie with each other to produce top class sportsmen for international competitions. For this scientific research is systematically conducted to identify the factors that help in achieving level of skill which a player can attain through proper coaching and evaluation in the last few decades sports have gained tremendous popularity all over the globe. The popularity of sports is still increasing at a fast pace and this happy trend is likely to continue in the future also. When one looks to continue at the history of modern Olympic games one sees that the number of sports for which competitions are held at Olympic games has increased steadily. In addition to Olympic sports indigenous sports have also become popular in each country. The television and press are giving much more coverage to sports.

The 20th century belongs to the great development of sports played by professionals for the entertainment of the crowd. Athletics, Basketball, Football, Cricket have attracted crowds on a scale never seen since Roman days.

As we know by nature human beings are competitive and aspire for excellence in every given field. Sports is not exception. Not only individuals but nations also want to show their supremacy in the field of sports. This friendly rivalry has inspired and motivated all to seat and strive, to run faster, jump higher, throw longer and
exhibit greater strength, endurance and skill in the competition arena.

Training in games and sports is no longer a myth and it has no casual approach but, it provides opportunities for scientific process and verification. Training has been accepted as a highly specialized science. Scientists are strivings to understand various factors affecting skeletal and muscular activity with the help of electro-myography etc.

In today’s techno- scientific age the world is progressing with great speed in all the field of life including games and sports. The scientific knowledge has revolutionized the sports field and the coaches are trying to get highest performance from their participants with the time and energy which they have at their disposal. The coaches and their performance which they have attained in the sports field. They want to achieve highest possible standard for which they are trying to put their best foot forward, with the help of the science and technology and through the scientific and systematic training.

The scientific equipment and facilities which are important for the progress in any field, have also helped in the progress of the games and sports. These are such as synthetic surface, sportsman kit, training and testing equipment and the sample research and published literature.

Scientists and physiologists have been of a view that human capacity of performance in athletics has its limits in the matter of standard of efficiency, but this
has been proved false and the barriers of performance have been suppressed by the athletes time and again as a result of continued improvement in technique, method of training and the knowledge of coaches.

Today, the winning in sports has become more important due to which the training method has occupied a prominent role. There is not a single sports in the world at the competitive level in which the resistance training is not being used as a conditioning programme for the development of the physical fitness. The muscular power has become common usage to indicate the ability to release maximum muscular force in the shortest possible time.

Explosive strength is a dynamic and important ability in all the sports and games. Explosive strength is the product of strength and speed. These two components of explosive strength are combined together in difference proportion in different activities. The importance of strength in acceleration the limbs at high speeds is well recognized and it effect upon speed such increased strength can be obtained through property administered programmers of resistance training whitehead gives example of coaches who had strong faith in resistance running as one of their important phase of training. Coaches like Arthur Lydiard in New Zealand, Percy circuitry in Australia, Gundar Haegg in Sweden and Jim Alfred in Wales all had some type is resistance training as a part of their athletics training. They have used hills whether mud or snow, sand or coal seem not to matter provided athletes are required to run fast using their arms vigorously and repeat the runs quite often.
Strength refers to the ability to ester a peak force for a single contraction. British National coach Paish stresses the need of strength for the athletes as an essential factor for the development of speed. Running is not a single maximum contraction, but rather a multi impact situation demanding a number of sub-maximal efforts. However, it is difficult to develop the true specific strength until a reservoir of pure strength has been developed. The only way to develop pure strength is through a form of progressive resistance exercise, using weights or some other form of resistance. AT the moment most athletes uses barbells etc. with discs as the most common method for applying resistance.

Training and conditioning includes those practices which are best to prepare the players for efficient performance through a carefully planned programme of progressive practices which will perfect co-ordination, eliminate unnecessary movements, accomplish results with minimum of energy expenditure and condition of muscles structure and circulation to withstand intensive demand made upon them.

The world of training methodology has crossed many milestones as a result of different types of research in general and their application to the sports development in particular. In the modern scientific age, athletes are being trained by highly sophisticated means for better achievement in their concerned sports. They are being exposed to the exercises and training methods which have proved beneficial for achieving higher standards. Much progress has been made in the recent years in the acquisitions of knowledge about training means and techniques of sports skills. In
sports training specialized exercises are being prescribed for the fullest and optimum
development for a particular game.

Stage of preparation is of paramount importance. Preparation, an independent
variable directly entails performance, a dependent one. Degrees of preparation
precipitate the performance of particular level. Preparation is genus and includes a
couple of species such as physical preparation and psychological preparation. Physical
fitness, skills of the game, field craft etc. can be logically enumerated under the head
of physical preparation where as will to win, determination to struggle, concentration,
psychological control over, physiologies along with the positive attitudinal change etc.
can be classified under the nomenclature of psychological preparation. Patanjali’s
‘Ashtang Yoga’ verily constitutes an integral part of psychological preparation. The
soccer king pelé of Brazil, after the conclusion of the match in Calcutta, critically
remarked that the Indian Soccer players did have the required skill of the game, but
they didn’t reach the expected level of physical fitness. Indian Hockey players are,
more often than not, off the mark in the blind zone o sticking circle and deficient in
penalty corner conversions. Physical fitness is found to be a casual visitor. Now it is
no more a secret that Indian cricketers miserably lack in killer’s instinct. Application
is Greek and latin to them and dedication as well as devotion always play truant.
Shiny Abraham an Indian meteoric sprinter could not keep herself to the lane in 800m.
run in the seoul Asiad. Physical and mental deficiency exist everywhere at every level
in the firmament of sports in India.
Goals of ‘Citius, Altius and Fortius’ can only be achieved through planned approach and preparation is a sine qua non of performance. The focus here is on physical preparation. Hence, this study has been undertaken by the researcher.

Championship performance is not something that just happens many coaches have explained the secrets of a champion athlete that they have developed through systematic conditioning and well planned training programme. The success in competitive sports calls for maximum fitness.

The standard of performance has been showing improvement and more and more records are being made or established in the events included in the Olympic and the world championships. To a certain extent this is due to improvement in track surface and equipments but to a much greater degree these achievements have been made.

Today almost every motion in the world attaches great importance to the development of sports in order to improve the nation’s health and for the well being of the future generations. Hence, a large number of governmental and para governmental organizations in close collaborations with private bodies, administer and supervisor even G.D.R. and U.S.S.R. also try to project the superiority of their political ideology and their political and social system through achievement in the field of sports. The increased number of athletes participating in the great quadrennial sports world is also an indication of the popularity and development of sports. Furthermore, the none ends criteria of new shows a continuous upward trend and
improvement in the standard of sports performance.

The desire to do one’s best to excel, to attain the highest standards of performance, to be supreme in his chosen field is a worthy human ambition which leads to better standards the personal growth. Excellence in any area does not come easily. The trail is hard and steep. There are numerous obstacles to overcome and barriers to push forth. Achievement of high skill in any field (athletics, art, surgery, science, writing or teaching) demands commitment and sacrifice. The greatest barrier we comfort in our permit of excellence is psychological in nature. Running a mile under four minutes was viewed as impossible until it was broken by Roger Bannister, when he clicked 3 minutes 59.5 seconds on 6th May, 1954. Since then, the 4 minutes barrier has been broken by approximately 500 athletes room all over the world. It was not the physiological make-up of runners that change but it was their psychological knowledge of what was possible. As man’s beliefs about limit change, the limits themselves change.

Competitive sports make a tremendous demand on the physical condition, physical fitness and mental power of the participant. Only athletes or sportsmen or women in the finest condition may withstand the wear and tear of the competitive season. Only the fittest can play to the best of his ability.

“Behind every super-performance lies a lifetime of discipline, consuming passion and unique talent. All three are essential for changing the horizons of games and sports.”
Today, the preparation of athletes for top notch achievement is completely dynamic state characterized by a high level of physical and psychological efficiency and degree of perfection of the necessary skills and knowledge, teaching and tactical preparation. An athlete arrives at this stage only as a result of corresponding training. Thus, athletes’ training today is a multisided process of expedient use of aggregate factors so as to influence the development of and athlete and ensure the necessary level of participation. In order to train a champions printers, the physical education teachers and coaches have to make a right choice in the selection of the athletes and than train them employing the best methods of training and coaching so that increase in performance capacity may be guaranteed. These seal efforts of channeling potential to the most suitable games or sports of selecting suitable players is helped to a great extend by the recent development in anthropology as it applied to sports and games and construction of objective and valid tests of fitness and skill. The world of training methodology has crossed many milestones as a result of different types of research in general and their application to the sports development in particular. In the modern scientific age, athletes are being trained by highly sophisticated means for better achievement in their concerned sports.

They are being exposed to the exercises and training methods which have proved beneficial for achieving higher standards. Much progress has been made in the recent years in the acquisitions of knowledge about training means and techniques of sports skills. In sports training specialized exercises are being prescribed fro the fullest and optimum development for a particular game. Champion performance is not
something that just happens many coaches have explained the secret of champion athletes than they have developed through systematic conditioning and well planned training programmes. The success in competitive sports calls for maximum fitness.

Main aim of modern sports competition is to detect and diagnose the human ability at nearly stage of life and channelize it in the right direction to realize the achievement aimed at in a particular sport/game. “Excelling,” “doing better,” surpassing are some of the expressions which are generally used to denote competition a sort of deliberate and conscious animosity that has existed for centuries and shall continue to exist.

So long betterment remains the goal of the society. Consciously or betterment remains the goal of the society. Consciously or unconsciously, everyone is competing in one or the other.

Competition is one of the outgrowths of modern society. It is the challenge which stimulates. Inspires and motivates men and women to sweat and run faster, jump higher, throw farther and exhibit greater strength, endurance and skills to exhibit supremacy over the other, Every individual or a team which participates in any sports/games wants to win as our society attaches a great significance to winning. According to Renews “performance is the keynote of all sports its basic principles, since sports have become prestigious aspect to prove one’s superiority, the philosophy of participation in games and sports has undergone a great change.” The remarkable improvement in the standard of athletic performances during the few decades
represent unique biological phenomenon. It was inconceivable even a decade ago, that some of the earlier established athletic records could be improved upon within such a short span. Apart from the phenomenal progress in training methods, techniques, as improvement in tools, equipment, track and various other associated factors which contribute in shaping world class athlete, genetically endowed human potential seem to play a great role in the final outcome. Everything else being equal, however, the nature of the contributory role of the genetic factors in sports events still a mystery, perhaps in a few years with rapid advance in the field of genetics clear picture may soon change.

Search and selection of potential athletes in specific field based on scientific knowledge is a matter of routine in many developed countries, unfortunately in India, this aspect has not been given serious consideration. Consequently athletes are selected from the “available pool” mainly on the basis of their performance records in various sports in various sports meets. It is often forgotten that such “talents” have already reached their peak performance with little scope for further spectacular improvement in spite of intense grooming schedules. Therefore, a fresh look needs to be taken to improve upon the methods of selection of Indian athletes. They need to be identified at a very young age. Training in games and sports is no longer a myth and it has no casual approach, but it provides opportunities for scientific process and verification. Training has been accepted as a highly specialized science involving the use of scientific methods and physical investigations.
Even through the best training to improve sport performance is to practice the movements at a same rate and intensity as during and actual game situation. There are other types of training activities which are supplementary for improving performance. Despite the vast amount so reach that has been done in athletic training. Most of what were known has been gain empirically through sweat and tear and on the training ground rather than what has née discovered in the laboratories of human performance, physiology and psychology. It is only after training method has been found by coach or teacher or athlete or both that the physiologist and psychologist confirm its worth. In games and sports, systematic training and conditioning of sportsmen ply vital role in building up peak performances. Therefore, specific training in games and sports has become a necessity for superior performance.

Today, there is not a single sport in the world at competitive level for which resistance training in some form or other is not used as a conditioning exercise. The day of general fitness training for top class sports are as much in the past as the scores of records that have been broken in recent years by athletes using more specific training methods. It is now recognized that muscular strength is the foundation upon which first class performance is built.

Athletics is all about running, jumping and throwing things citius, altius, fortius are the word which appear beneath the rings and serve as a sort of Olympic motto are meant to inspire athletes to run faster jump higher and throw farther and to strive always to do better than before when athletes run or jump or throw things they
worry about their muscles and their feet. It’s the worry that makes their face ugly. Some athletes only run short races. But they run very fast. This is called sprinting. It is so fast that the arms and legs go all blurred for the improvement of locomotor's ability. Sprints are used. But the duration/distance of the sprint must allow full acceleration followed by desirable duration/distance for maintenance of maximum speed. Interval method is more suitable for the improvement of speed endurance in team games, combat sports and racket sports. Like all training methods, interval training expanded empirically. Athletes have been the first to make use of it. They have learned it gives greater endurance and enables him to better his performance. The surprising element about this new method, was the fact that one wanted to increase one’s endurance by repeated runs over short distances. That interval training should make the runner stronger by runs over short distances. That interval training should make the runner stronger by runs so short as the 100 and 200 meters was for the athlete difficult to accept and appeared incredible. This method was too much different from ordinary methods. We had learned from long ago the old saying “The runner gains in endurance when he runs over long distances at a calm and regular rhythm. This now had to be interpreted in exactly pain associated with approaching exhaustion.

In sports and games, conditioning and training play vital roles in the improvement of human performance, especially at the competitive levels. Therefore,
specialized training in sports and has become necessity for superior performance. In recent years greater stress has been laid on the quality rather than the quantity of training. The sports scientists and experts of sports want their sportsman to extract maximum achievement for their training procedures without causing too much strain on them. This is possible only if coaches and teacher of Physical Education apply the performance of the athletes.

Much progress has been made in recent years in the acquisition of knowledge about training means and techniques of track events. In modern athletic training specialized exercises are presented for the fullest and optimum development of a particular component of fitness and muscles involved in performing a particular event. Coaches and physical education teachers must extract maximum achievement from their trainees without much strain. This is possible only when coaches and physical education teachers hit most beneficial means of training for the athlete.

The standard of performance has been showing improvement and more and more records are being created in the events included in the Olympic and the world championships. To a certain extent this is due to improvement in track surfaces and the equipment but to a greater degree these achievements have been made possible due to improvement in the methodology of training and coaching.

“Speed in training theory is defined as a capacity of moving a limb or parts of
the body’s lever system or the whole body with the greater velocity.”

Speed is not only necessary in sports activities where man compels to show his superiority but also in activities with which nature has blessed making. Speed is the rapidity with which one repeats successive movements of the same pattern. Great speed is muscle contraction is not always conductive to the greatest efficiency of movement. It seems that there is an optimum speed at which muscle contract with the greatest conservation of energy for the amount of work done.

In speed dependent sports, it is important that speed at technical performance is introduced early. However, this must not compromise the basic technical model. Speed is considered under the heading of “conditioning training” in many programmes, due to the possible combination of speed with strength, endurance and or mobility. However, it may equally be considered as a sophisticated extension of technical training. Practices for the development of speed are specific to the technical demand of a sport. Such demands vary according to involvement of strength, endurance and mobility, and synchronized use of varied speed of joint action and the requirement of optimum speed. Running speed is the product of length and frequency of stride. Yet these two factors are always interdependent and maximum running efficiency exists only when they are in correct proportion, depending mainly on the weight, build, strength, flexibility and co-ordination of the runner.
Speed plays a vital role in all games and sports but plays a very dominant role for sprinters. For a sprinter to give good performance he must possess acceleration speed, sprinting speed, speed of movement and reaction time. Even through these four components of speed affects the performance of a sprinter yet the contribution made by reaction time to enhance speed performance is still not very certain. There is no doubt regarding the contribution of acceleration speed, sprinting speed and speed of movement to bring about better performance on the part of sprinter. Therefore, to attain optimum performance in activities where speed is the main factor acceleration speed, sprinting speed, speed of movement and reaction time should be woven together.

It would be worthwhile to review the factors affecting sprinting in order to identify areas of research in developing the factors for further improvement in the sprinting ability. The important factors may be identified as the structure of the body of the athlete, age, temperament, technique of sprinting, condition of track and use of equipment such as starting blocks. The profile of sprinters seems to be that of a man of average height with good musculature especially around the thigh region. Speed is natural girt. It is characterized by:

A) The natural speed of contraction

B) Neuro-muscular co-ordination

C) Explosive power which can be developed.
Development of speed one of those cases where organism had to adopt itself to the steadily growing force of “excitation” of the stresses this force is the frequency with which excitation acts pursuit time.

Bush and weiskopt, have explained that speed strength relaxation and proper mental attitudes are essential factors in sprinting success, but. If a runner does not possess natural speed he never be champion sprinter. While we agree that sprinter as a rule are born and not developed their speed can be improved through the effective execution of the basic mechanics of running and conditioning. A champion sprinter is the product of long training and practice.

White head, expressed his strong belief acceleration runs for development of speed. He suggested that an athlete should run a distance of about 80 meters 3 to 4 times gradually increasing his speed repeating this in or three sets of four repetitions, thrice a week in completive season. This will bring about winning result. As running shorter distance with maximum effort requires an aerobic capacity. Speed of acceleration and sprint endurance, all these characteristics are improved by acceleration. Therefore, now-a-days acceleration runs are used by most of the coaches and physical education teachers to train their athletes for speed.

Dentiman, also discussed some specialized programmes for the improvement of sprinting speed in his article entitled "Factors Affecting Sprinting Speed," part II. These are downhill running, towing treadmill running, training on uphill running and stair case sprinting.
Uphill running improves speed through an increase in the rate of leg movement, leg strength and power and physical endurance. It can serve as a training supplement or part of the regular programme especially during off season training.

The hill should be graded between 15 and 30 degree and anywhere in length from 40 to 60 yards. It is best if the hill can be circuited, so the runner need not stop or change direction.

In sports activities some amount of resistance (if not external than one’s own body weight) has to be over come. The strength therefore, is and important factor on which the sports performance depends. Depending upon the magnitude and type of resistance to be tackled in various sports, the sportsmen of different sports need different levels and types of strength to achieve good performance. The greater, the resistance, the stronger should be the sportsman. Strength is needed not only for competition but also for successfully carrying out the training programmes. A high level of speed, endurance, techniques, tactics and other coordinative abilities is impossible if the sportsman lacks the requisite amount of strength.

The rope jumping is considered as one of the part of plyometric exercises which require the subjects to jump over ropes placed at a particular height with equal distance between them. The rope jumping has been used by coaches and the athletes as an effective method for developing leg strength. Research indicates that strength training programmes, when properly altered; result in both increased
strength and explosive power. Weight training hopping and jumping routines, and weighted and ankle sports are all effective methods of improving these important qualities. Hoping and jumping exercises are popular in the training so sprinters and have been used successfully by Russian athletes. This procedure is valuable in the development of leg strength, leg endurance, explosive power and the strength of the supporting muscles of the knee and ankle. Hoping and jumping possesses the added advantage of simulating the sprinting action or involving similar muscle groups; thus, the principle on specificity of training ensures greater carry-over to the sprinting action.

Other forms of resistance running include harness running, running in heavy boots, running with sacks of sand on the back and running with weighted belts. Basically the athlete performs the movement with a belt secured about the waist. The belt is attached to ropes which are held by the partner who provides a resistance proportionate to their being effective movements coming from the performer. Harness runs can be performed for a period of time or for a distance. It is most helpful if the coach can apply the resistance as he can place certain emphasis on movement by calling to the performer from behind e.g. greater ankle extension, higher knee lift etc. the resistance does not have to be applied by a partner. It can be applied by weighted sleighs which have the advantage that degree of resistance can be measured and standardized.

Strength is defined as the capacity to exert force or as the ability to do work
against resistance. Therefore, strength training programmes should observe the following principles if maximum benefit in terms of improved sprinting speeds and performance are to be attained.

1. Since muscle shortening (hamstrings in particular) does occur after heavy resistance work, a series of stretching exercises should always follow each workout.

2. Strength training should be used in conjunction with actual sprint training, both in season and off season, rather than as a replacement for sprint training. When two programmes are used simultaneously sprinting speed is significantly improved.

3. Contraction is placed upon the muscle (upper and lower torso) involved in the running action. Exercises are then chosen to activate and strengthen these muscle groups.

4. General principles of conditioning must be followed with the hypertrophy cycle providing enough rest between workouts to allow maximum exhalation or regeneration that elevates conditioning beyond their exercise level. Alternate day programmes are used only for sprint training, flexibility exercises form training, stride training and other special supplementary programmes.

5. If speed is the desired outcome exercises must be performed explosively.
6. Heavy resistance exercises, such as weight training be follow the sprint training session or formal practice in track and field, football, basketball, soccer and baseball.

7. Injuries are linked with uneven development of agonist and antagonist muscles. Sprinter should avoid strengthening one-sided development (agonist) and must find and optimal balance in strength and power training for both agonist and antagonist muscle groups.

Competitive sport is a place where the you and super challenging athlete fight for supremacy and records. The athletes are sophisticatedly prepared by expert sports scientists and coaches to tussle among themselves, hence to win and then to enjoy their dreams and fruits of the efforts put in for years together. The fact is that today’s athletes are simply stronger. Faster and more efficient then yesterdays and tomorrows may be still better.

Strength training is important for all athletes, not just a chosen few or those who happen to enjoy it. It for no other reason that the fact that strength protects against injury, such training should become rule rather the exception.

Strength or the ability to express force. Is a basic physical characteristic that determines performance efficiency in strength each sport varies in its strength requirements and in the interest of specificity, we should examine its relationship to speed and endurance. There are three classifications of strength namely, maximum
strength, explosive strength (power) and strength Endurance. The last two are most pertinent to sport in general but maximum strength should nevertheless, be considered as a measure of the maximum strength component of explosive strength and endurance. Exercise with one’s own body weight as resistance has been employed to develop explosive strength e.g., step-ups, jumps, pull-ups, push-ups, rope climbing etc.

These exercises if properly done are very effective for improving explosive strength and strength endurance. Most of these exercises are done without and equipment. The load intensity of these exercises is automatically related to one’s own body weight. In several sports and in cases where weight training equipment is not available the strength can be effectively developed through exercise with one’s own body weight as resistance.

In athletics, some amount of resistance has to be overcome and greater the resistance, stronger should be the athlete as per the principles of resistance training. If an athlete wants to develop high level of physical fitness he must possess accordingly the high degree of strength which is considered the ability of the athlete to overcome the resistance. The strength can be dynamic or plyometric. the maximum strength is highest possible resistance a sportsman can overcome through voluntary contraction, the explosive strength is the ability of the sportsman to overcome the resistance with high speed and the strength endurance is the ability of the sportsman to overcome the resistance under conditions of fatigue. All these types of strength can
be developed through different types of strength training programmes.

In process of muscle contraction it is vital to know which way muscles contract during the competition on order to select the proper strength training exercises and strength of movements.

The two principle types of muscle contractions are:

1. Dynamic muscle contraction which is further divided:
   
a) Concentric muscle contraction is the shortening of muscle, while the muscle develops the tension.
   
b) Eccentric muscle contraction, when the muscle lengthens as it develops tension.

2. Static muscle contraction means that the length of the muscle does not change, while the tension is developed.

Another new method of strength training which is called plyometric is gaining popularity.

Isotonic type work with weight used progressively, does lead to increase in muscle power but it also increases heart and lung capacity, this type of training needs to be effective, but towards the competition period, it should be substituted by plyometric types of exercise to maintain and further develop the muscle strength under the influence of speed which is the need of the sportsman.
In athletics all the movement to be performed requires highest possible speed whether it is running, jumping or throwing events, which needs tremendous strength for good performance. It would be better to find out the best method to develop the muscle power through isotonic and plyometric exercises. The vital need of all the sprinters is tremendous amount leg power, which is necessary for the fast movement of the leg, explosive start and the capacity to maintain the speed which has been developed after the start of the race. Power is the rate of doing work. Relative importance of strength of sprinter has been emphasized many times by various investigators. Brown has stated that sprinting (races up to and including 440 yards) demands a high degree of muscular strength in the form of power.

Plyometric training is very specific in nature but very broad in applicability. For the lower extremities. It is designed to train the athlete to develop either vertical or horizontal acceleration, and all movements in running and jumping are simply the extension of same vertical or horizontal force against the ground. Even change of direction falls into this category.

Specificity is a key concept to keep in mind when planning a plyometric training programme. The sports and skills to be developed must be analyzed to design the proper exercises. To develop start speed from crouch position, standing long jump or double leg jumps will be more effective than the depth jumping.

Dintiman and Ward, have described that if the double leg and single leg bounding type plyometric exercises are used regularly, they improve the sprinting
speed of the runners. These exercises result in a down time 2-3 times larger than the sprinting action. Although some of these exercises are important because the down time is similar to the start and acceleration phase of the 40 yard dash. To improve the sprinting speed most of jumping exercises with short down time should be included in the training programme.

The actual term plyometrics was first coined in 1974 by S. Fred Witt. One of America’s more forward thinking track and field coaches based on Latin origins plyometric as interpreted to mean “measurable increases”. These seemingly exotic exercises were taught to be responsible for the rapid competitiveness and growing superiority of Eastern Europeans in track and field events.

Plyometric rapidly become known to coaches and athletes as exercise or drills aimed at linking strength with speed of movement to produce power plyometric training become essential to athletes who jumped lifted or threw. Plyometric exercises are a system of exercises to develop the athletes for various athletic specialties developed by coaches in U.S.S.R. Verhonshanski has described a plyometric technique called depth jumping. The procedures required athletes to drop form height and upon landing. Immediately perform a jumping movement. He suggested that depth jumps like other plyometric exercises increase strength and nerve reactive ability. He believes that these increases will improve vertical jumping ability.

Plyometric exercises are one’s in which the athlete by forced eccentric contraction such as a drop form a height, attempts to increase exercise performance
Depth jump is one of many plyometric exercises. In depth jumping, the athlete stands on a shelf generally 0.2 meter or higher above the ground. Stepping off the shelf they immediately perform a maximal effort vertical or horizontal jump after landing on the ground.

We are looking at methods for inspiring the development of the elastic component of the muscles by using some form of plyometric training, or by using a slight resistance that will not detract from the speed component while at the same time hoping to increase the specific strength component. There is a need to consider the specificity of the event so that training methods use a similar pattern of muscular movement to that performed in the event proper. The term plyometrics involves the muscles working both concentrically and eccentrically.

Plyometric (plyo-more greater; metric measured, quantity) exercise is based upon the belief that a rapid lengthening of muscles just prior to a contraction will result in a much stronger contraction. The added contractile strength is believed to be due to a stretching of muscle spindles involving a myotatic reflex and resulting in an increased frequency of motor unit discharge, stimulation of other receptors and an increased number of activated motor units.

Plyometric exercise is a relatively new concept of training that applies a that scientific principles regarding the present stretch conditions of the muscle prior to explosive contraction.
Interest in this jump training increased during the late seventies, as east European athletes emerged as power on the world sports scene. As the eastern bleak countries began to produce superior athletes in such sports as track and field, Gymnastics and weight lifting the mystique of their success began to center on their training methods.

Verhoskauskiy (1968) has described as plyometric technique called depth Jumping. The procedure requires athlete to drop from a height and upon landing immediately perform a jumping movement. Verhoskauskiy suggested that depth like other plyometric exercises, increase strength and nerve reactive ability. He believes that these increases will improve vertical jumping ability.

Plyometric is an area of conditioning that is beginning to receive a great deal of attention in the strength training profession. Purportedly. Plyometric training represents the link between strength and speed.

The term plyometric applies to those drills or exercise in which a muscle is forcefully prestretched prior to a contraction. Theoretically the elastic nature of muscle fibers allows a muscle to store potential energy during the eccentric phase of a movement which is then released as kinetic energy during the eccentric phase of a movement which is then released as kinetic energy in the ensuing concentric contraction causing a rapid, explosive movement. Various Exercises (e.g. bounding, hopping, depth jump, Box drills) have been developed in which the force gravity (coupled with the athlete’s body weight and in some cases, I weighted vests and/or
dumbells) is used to elicit this so called “stretch” (or myotatic) reflex of a muscle.

Muscle elasticity is an important factor in understanding how the stretch – shortening cycle can produce more power than a simple concentric muscle contraction. In Jumping the muscle can briefly store the tension developed by rapid stretching so that they possess a sort of potential elastic energy for and analogy consider a rubber band. Whenever we stretch it. These exists the potential for a rapid return to its original length.

The stretch reflex responds to the rate of which a muscle is stretched and is among the fastest in human body. The reason for this is the direct connection from sensory receptors in the muscle to cells in the spinal cord and back to the muscle fibers responsible for contraction. Other reflexes are slower than the stretch reflex because they must be transmitted through several different channels and to the central nervous system before a reception is elicited.

Anyone undertaking a plyometric training programme should have a reasonable amount of flexibility plyometric training is strictly anaerobic (without oxygen) in nature and utilizes the creative phosphate energy system, allowing maximum energy to be stored in the muscle before single exposure act, using maximum power. Plyometric training is quite versatile, it can be formed indoors or out.

In plyometrics intensity is controlled by the type of exercise performed.
Plyometrics ranges from simple tasks to highly complex and stressful training. Plyometric training can be integrated with resistance training by imposing speed-strength task. The procedure of plyometric exercise must correspond to age, sex and biological development of the sportsperson. There should be gradual increase of stress during a complete training cycle. Body weight should be determining factor in assigning the volume of jumps in work out. Generally the number of sessions devoted to plyometric training is two to three per week.

Stair running is superb training for running. In addition to strengthening the muscle around the knees, stair running builds stamina and overall lower-body strength, works the glutei muscles and quadriceps more than road running and is a highly efficient work out in terms of the amount of time spent at very high intensity what’s the catch? In a word, it’s a killer.

“Although it’s phenomenal for conditioning, stair running is tougher than most runners realize, “says New York road runners club wellness director Beryl bender. “Even stair-climbing machines seem easy in compression”. plus stairs are better a helping one develop leg strength and lend themselves better to adding ploys work (such as hopping up stairs).stairs are ales inherently safer than sprints because there is less stress on your hamstrings.

Climbing stairs is, for many people, a daily activity while for other it is also an effective form of exercise .Athletes from a variety of sports use stair climbing as a conditioning work out and it is not uncommon to see people running up and down
stadium or office building stairs. one of the most well-known and popular it the annual Empire state building race that involves running up 86 flight, a total of 1,576 steps and a gain in altitude of about 1,200 feet.

The purpose of running stadium stairs for cross training running stairs is a powerful addition to any training regimen. It has been used by athletes for decades now, and the reason it has sustained is because of its great effectiveness in building lower body strength and endurance. Nothing builds leg muscles better.

Because of the nature of the exercise the leg muscles are forced to work much harder than in normal running exercise the mechanical trouble of pushing upward as you run causes them to push to the limit and increase in strength and power to overcome this problem.

Most beginners try between five and thirty repetitions to start, depending on what they are comfortable with –one step is a good way to start off such a regimen but two is a good challenge for most people. Three is good for genuine athletes and four is Olympian caliber. Don’t forget to stretch before and after this exercise to avoid tightening of the muscles.

Some athletes changes up their routine by adding diagonal or side lunges to your stair running routine. This will further put your muscles at a disadvantage and strengthen them even further. And the new angles exercise and flex muscles that might not get used otherwise. The greater the range of motion used in your exercise
the better your overall result is going to be.

Running step is one of the best ways to build strength in key athletic muscles, and the practice is even more beneficial than it is given credit for in today’s athletic culture. It is vital addition to any serious cross training program.

In any sport-strength, explosiveness, and endurance are some of the major keys to success. An easy way to build these physical qualities is by running stairs. All you need is access to a staircase or stadium (most school football fields have stairs) for a weekly workout. Football stand stairs are ideal since most have more than 100 steps.

Start by running at the bottom of the steps and run up them as fast as you can without skipping steps. Then walk down slowly. Repeat this routine for a total of three five sets. Your legs should be pretty sore the next day. Work your way up to a total of ten sets. This routine will quickly build your overall endurance and leg strength.

When ten sets without skipping steps becomes easy, you can start carrying 10-25 pound dumbbells in each hand or carry them in a backpack. The increased load will help build your thigh, but and elf muscles slowly work into skipping every other stair to help create explosive power which will decrease the overall time needed to complete your stair routine.

It’s a good idea not to begin this stair workout until you get yourself in good physical condition by jogging 15 to 25 minutes, 3 to 4 weeks. This will strengthen
your heart and lungs so it want to be too much of a demand on your body.

While nay technically an agility drill, running stairs is a great way to develop quickness and foot speed while getting an excellent interval work out.

Running stairs provides a cardiovascular benefit similar to that of running and is a great way to build sprint power. Many athletes train at a stadium of a local outdoor stair way with about a hundred steps.

Begin by walking one step at a time. Avoid running stairs on your first workout more than two stair workouts a week. by week three use the return to the bottom as your rest interval, and then do another set. Work up to about ten sets per workout.

There is no doubt that there are cross-over benefits from running stadium. in line with the specificity of training principle, you are using muscle groups in a running-cycling or even walking/hiking. It is indeed a running motion. it also isolates muscle action similar to running hills for runners in the great mountains of florid (In case you’re wondering, that’s sarcasm-their biggest hill is a highway overpass.) it can substitute for hill training. If stadiums are combined with other strength oriented drills and exercises it becomes a powerful base training workout.

One drawback is the innate nature of this training in which your stride is shortened while you accommodate the step distances and patterns. Remember, the two ways we get faster are extending stride lengths and quickening stride rates
therefore this must be countered. This leads us to a couple of critical elements to get the most out of our stadiums.

1. When running stadiums run up with quickest leg turnover possible. (Think “hot coals” under my feet.)

2. Use exaggerated strides for stride length enhancement. (Think “power” or “bounding” strides on the physiological level, the quick reps work to decrease foot contact time and improve leg turnover. The bounding reps work to elongate strides organically. The exercise improves core strength for a more comprehensive workout. These are three important aspects of training that lead to improved efficiency in your running. Therefore these must be integrated into stadium stair workouts.

A cautionary side of running stadiums is safety. Returning down stadium is tricky. It we run on the seat/benches versus the stairs; it requires even more concentration. When fatigue sets, in, falls are not going to be fun. So most of the time I advocate a quick walk with “light stepping” for your trip the bottom. This functions as your recovery interval. There is no recovery at the bottom-just power up the next rep without delay.

Stair running is a great, high-intensity workout that helps build speed power and cardiovascular fitness. Stair running is also a great addition to any agility training program because it builds quickness and foot speed while getting an excellent sprint workout.
Scientific knowledge has revolutionized the standard of performance in sports disciplines. Almost all sports call for the basic motor qualities such as speed, endurance, and strength, some sports in particular such as athletics, soccer, hockey, cross country and skilling have tremendous aerobic and anaerobic demand on the body. Improvement in training methods has enabled man to significantly reduce his times in running events. Hard intensive work is the key to the top conditioning that makes near-record and record-breaking performances possible. Stair and ply metrics emerged as a great help for the coaches and athletes as it uses the overload principle to cardio-respiratory system, barring sufficient stress in the form of a specific work load and time factor is applied in order to develop various motor qualities.

The present investigator has undertaken this research to observe the effect of development of strength, whether influence the speed quality and other performance factor determined school boys and girls.

**STATEMENT OF STUDY** - Statement of the study emerged as follows-

“A COMPARATIVE STUDY OF THE EFFECT OF SELECTED TRAINING PROGRAMME ON SPEED, LEG STRENGTH AND CARDIO-VASCULAR ENDURANCE IN SCHOOL BOYS AND GIRLS.”
AIMS OF THE STUDY -

The investigation would be carried out keeping following aims in view-

1. To study the effect of twelve weeks stair training programmed on performance of boys and girls in speed, leg strength, cardio-vascular endurance.

2. To study the effect of twelve weeks ply metric training programmer on performance of boys and girls in speed, leg strength, cardio-vascular endurance.

3. To make a comparative study of the performance of the boys and girls in speed, after stair training programmed.

4. To make a comparative study of the performance of the boys and girls in leg strength, after stair training programmer.

5. To make a comparative study of the performance of the boys and girls in cardio-vascular Endurance, after stair training programme.

6. To make comparative study of the performance of the boys and girls in speed, after plyometric training programme.

7. To make a comparative study of the performance of the boys and girls in leg strength, after plyometric training programme.

8. To make a comparative study of the performance of the boys and girls in
cardio-vascular Endurance, after plyometric training programme.

**LIMITATIONS -**

The study was conducted the following limiting conditional factors;

1. The number of subjects was the limitations of the study especially for the 192 boys and girls from air force school, Gorakhpur only.

2. Total 192 subjects’ boys & girls were divided into three groups, there was two experimental groups and one control group, each group consisting of 64 subjects.

3. Motivation and interest of the subjects was the vital limiting factor to provide the best results.

4. Level of the subjects was delimited to Gorakhpur district only.

5. 26 cm high stairs was used for numbers of stairs between 20 to 25.

6. Height, distance and numbers of boxes in plyometric training will be delimited.

7. Time period of training was twelve weeks.

8. Testing were delimited are as follows:-

**TEST - 1**

1. 50 m run from standing start-for speed.
TEST - 2

2. Vertical jump test-for leg strength (Explosive strength).

TEST - 3

3. Cooper’s 12 min run and walk test-for cardio-vascular endurance.

HYPOTHESIS -

Following hypotheses have been formulated in the context of the objective of the investigation-

1. There was no significant difference in the average performance of boys & girls in speed, after stair training programme.

2. There was no significant in the average performance of boys & girls in leg strength, after stair training programme.

3. There was no significant difference in the average performance of boys & girls in cardio-vascular endurance, after stair training programme.

4. There was no significant difference in the average performance of boys & girls in speed, after plyometric training programme.

5. There was no significant difference in the average performance of boys & girls in leg strength, after plyometric training programme.

6. There was no significant difference in the average performance of boys & girls
in cardio-vascular endurance, after plyometric training programme.

7. There was no significant difference in the average performance of boys & girls in speed, after control training programme.

8. There was no significant in the average performance of boys & girls in leg strength, after control training programme.

9. There was no significant difference in the average performance of boys & girls in cardio-vascular endurance, after control training programme.

These null hypotheses would be checked with the help of paired t-test.

**DEFINITIONS**

**STAIR TRAINING** - “It is a type of running which is being done on the stairs from the ground with the speed should be maintained throughout the movement.”

**PLYOMETRIC TRAINING** - “Plyometric exercise is a relatively new concept of train that applies the specificity principals regarding the present stretch condition of the muscle prior the explosive contraction”.

**SPEED** - “Speed is defined as ‘rapidity’ with which a movement of successive movements of the same kind may be performed”.

**STRENGTH** - “Strength is the ability of the muscle to overcome resistance”.

EXPLOSIVE STRENGTH - “It is the ability of the sportsman to overcome resistance with high speed. Explosive strength is complex conditional ability and is a combination of strength and speed”

ENDURANCE - “Endurance is the resistance capacity of organism against fatigue during sport exercises of long duration i.e. to maintain a load of relatively high intensity during a longer time”.

**Significance of the Study**

The world of games and sports is ever expanding and progressing at a very fast pace. It is dynamic in nature and progressive in outlook. It is not confined to “what has been,” its target is to march ahead.

Through different types of researches and scientific advancement in general and their application in the field of sports in particular games and sports have undergone revolutionary changes and crossed many mile stones.

The main factor responsible for this improvement is the development of new training methods based on scientific principles.

Sprinting speed has varied application in the field of games and sports. Particularly in short distance races, horizontal and vertical jumps. The speed is a vital factor in winning.

The coaches and physical education teachers for quite some time have been
trying to find out the way and means which will help them to train most economically and efficiently keeping the importance of sprinting speed in games and sports, particularly in shout distances. The research scholar felt the need to investigate the comparative effects of different training methods, stair training plyometric training dominated by speed, explosive strength and cardio-vascular endurance performance.

For the reasons stated above the result of the study may be of vital importance in the following ways

1. The study will help; the teachers of physical education and coaches by informing them about the training effects produced by the different training means i.e. stair training and plyometric training on improving the timing of 50 meter dash (speed), leg strength and cardio-vascular endurance performance.

2. The result of the study might reveal which of the training means employed in the study are superior to the others in improving acceleration speed, explosive leg strength and cardio-vascular endurance.

3. The finding of the study might high light the differential effects produced by the two types of training methods, selected for this study on speed, leg strength and cardio-vascular endurance.

4. The physical education personnel and coaches will be able to select as to what type of training will be best suitable for their athletes.

5. Based on the result of the study, teachers of physical education and coaches will be able to organize their training programme effectively.