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INTRODUCTION
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INTRODUCTION

Sports in the present day have become extremely competitive. In the modern world, the records of athletic events are often broken with new records replacing the old. Through systematic training programmes, an athlete can improve the strength, speed, endurance and agility, to perform better in competitions.

The popularity of sports is ever increasing at a fast pace and this encouraging trend is likely to continue in to the future as well. The television and press are giving much more coverage to sports and have become the effective medium to carry sports to millions and millions of people around the world. Sports have become an important social and cultural entity of the modern world.

1.1. BENCH STEP TRAINING

Bench step training procedure requires the subject to lift his weight to a known height (Height of Bench) predetermined rate set by a metronome. This procedure requires no expensive equipment, very little skill and is adaptable for large group.

Within the last few years, step bench training's popularity has climbed rapidly. An estimated 10 million people have tried step training. Vigorous stepping provides the cardiovascular benefits of running but strains the joints little more than walking.

Before beginning a step training, one is sure that the platform is secure and at the proper height for fitness level. If one is new to step training, or just beginning a fitness program, start with a platform four to six inches high, keep the area around the platform dry and remove objects that could interfere with the workout.
Proper body alignment during step training helps prevent injuries while stepping.

1. Relax the neck and keep it straight.
2. Always keep the knees soft, and avoid locking the knee joints.
3. Maintain good posture with shoulders back, chest lifted and pelvis tucked under.
4. Lean from the ankles, not the waist, as you step on to the platform. Do not bend from the hips.
5. Don’t arch your back.

Correct stepping technique also prevents injuries and improves the workout.

1. Always place the entire foot on the platform, no part of the foot.
2. Step close to the platform, allowing the heels to contact the floor.
3. Step quickly, pounding can unduly strain the ankles and knees.
4. Keep an eye on the platform all the time.
5. Don’t use hand weights. They greatly increase the risk of injury and provide no benefit.

To avoid injuries caused by too much stepping, alternate step training classes with a variety of aerobic workouts like bicycling, walking or other recreational activities.

Step training workouts may seem difficult at first, but they are habit forming exercises and help to maintain proper body alignment.

1.1.1. Bench Step Training on Sports Performance

Bench step training plays a vital role in determining the sports performance. Bench step training must develop the specific physiological capabilities required to perform a given sports skill or activity.
Bench step training given to athletes is a matter of constructing exercise programmes that develop what the individual will need for his/her specific event. The coach must therefore give equal consideration to increasing the athletes skill and developing his/her energy capacities. Athletes might be considered easier to train than non-athletes as they should know which specific energy system must be developed for their particular activities to work and achieve high performance. Thus bench step training programmes based on running have some beneficial carryover effect on the performance of sports skills, not involving a shred deal of running.

Arnheim (1985) stated that Bench step training is usually defined as a systematic process of repetitive programme exercise or work, involving also the learning process and acclimatisation. The primary objective of intense sports conditioning and training is to put the body with extreme and exceptional case under the influence of all the agents which promotes health and strength in order to enable it to meet extreme and exceptional demands upon it.

1.1.2. Bench Step Training on Motor Ability Components

The components of physical fitness are strength, endurance, speed, agility, flexibility and co-ordination. Bench step training must develop almost all the physical fitness components. Importantly it develops the leg strength and leg explosive power.

1.2. INTENSITY OF TRAINING

Intensity is the most important of the prescriptive components. It is also the most difficult because of the necessity to bring it under control, that is intensity is expressed in terms that they are stable such as heart rate, so attention must be made to conditions that create stability and the methods that monitor change.

Hellerstain (1993) stated that most exercise physiologists agree that the physiological and biochemical changes associated with training occur at about 70 percent of the individuals maximal aerobic capacity, whereas intensity less
than 60 percent are not nearly sufficient. The same experts have also warned adults exceeding 90 percent of their maximal aerobic capacity even during peak exercise effort. They recommend that most adults work at an intensity somewhat between 60 percent and 80 percent of their maximal capacity for safe effective training. These levels can be estimated by using heart rate as a guideline.

Shaver (1982) stated intensity is the most critical of all in developing cardiorespiratory endurance fitness. It depends upon an individuals' present level of fitness, their present health condition, and the length or duration of the training. The intensity of work can be expressed in several ways including 1) a percentage of maximum heart rate, 2) a percentage of maximal oxygen consumption, 3) number of calories consumed, or 4) in METS. During submaximal or aerobic work, it has been well established that heart rate increases linearly with energy cost (or oxygen uptake) of the work. Because of this and for practical reasons, exercise heart rate has been used by many researchers for determining not only the physiological stress of the work, but also for developing various training programs.

Johnson and Fisher (1992) stated that the proper intensity of training can be determined by simple trial and error. If an exercise bout results in a heart rate that is below the training heart rate, increase the speed or intensity of the next bout; if the heart rate is above the training heart rate, decrease the intensity of the next bout. One of the great advantages of this type of program is that it allows exercise in many varied and different conditions with minimal danger. The heart rate will accurately reflect the stress level on the body and allow an adult to exercise safely in the heart or at altitude. The speed of the activity may decrease but the training effect will be same. The principle works in other ways too. As the cardiovascular system becomes more efficient, work will become easier and the tempo of the activity will necessarily increase to maintain the training heart rate. Training by heart rate has many advantages over training by time and distance.

Exercise intensity should be checked frequently during the beginning of an exercise program. This requires some practice in taking one's pulse rate usually in the radial or carotid artery locations. Since it is rather difficult to palpate the
pulse during exercise, the pulse should be taken for a period of ten seconds immediately after stopping, beginning the count with zero. If the rate is below the prescribed training range the intensity should be increased, if the rate is above the range the intensity should be reduced.

For cardiovascular conditioning to take place, the intensity should exceed approximately 50 percent to 60 percent of functional capacity (VO₂) and for safety and comfort, not to exceed 75 percent to 85 percent. This usually translates to a heart rate training range of 70 percent to 85 percent of maximal heart rate.

Maximal heart rate can be estimated to be 220 for apparently healthy individuals under age 45 with no coronary risk factors. Endurance training also tends to show somewhere around 185 to 190 beats per minute and to be lower at the resting heart rate. For instance, resting heart rates in highly trained athletes may be as low or lower than 40 to 45 beats per minute. On the other hand in healthy but untrained subjects resting heart rates may be as high as 90 to 100 beats per minute. Thus the trained subject is generally characterised as having a low resting heart rate and the untrained as a high resting heart rate. The highest attainable heart rate during performance of strenous work not only depends upon the state of conditioning but also upon age.

The intensity and length of the work interval should be based upon the primary energy system being used in the activity. Sprinters should have short high intensity intervals whereas marathons may run intervals of 3 miles at race pace or slower. It should be pointed out that the rest interval is really not a time to stop all activity, but only a jog or walk period which allows the body to recover somewhat before the next interval begins.

1.2.1. Varied Intensities and Its Effect

The training effects of walking programme depends upon the amount of stress imposed upon the relevant part of the body. There are variations in the resting heart rate of different individuals and the percentage of heart reserve that is used in the walking programme gives a better indication of intensity.
Hayward (1991) stated that exercise intensity is expressed as a percentage of functional aerobic capacity and is usually between 40% and 85% of VO$_2$ max. The average initial training intensity for healthy, active adults is 60% to 85% VO$_2$ max. Generally, the more fit the individual, the higher the exercise intensity required to produce desired changes.

Physiological changes ranging from training are generally related to the intensity of the exercise. Intensity is expressed in terms of effort relative to the subject's initial capacity. The enhancement of capacity is greater, when load of 90 to 100 percent of the individual capacity are applied. Maximal loads are potentially injurious and painful and are utilized mainly by athletes in their final training for championship performance. Significant training changes occur at levels of intensity as low as 25 percent of maximal cardiovascular functions of middle aged men which improved identically at the intensity of the individuals maximum heart rate, equal to 70 and 87 percent of his maximal oxygen uptake.

1.3. FREQUENCY OF TRAINING

Shaver (1982) stated that frequency of 3 to 5 days per week is an optimal number of workouts for developing fitness levels. Once a regular exercise routine has been established and the workouts have become enjoyable, then the frequency of workouts may be extended to more than 3 to 5 days per week. It is important, however, not to initially start out training everyday of the week since chances are good that the individual, after a couple of weeks, will become completely exhaustive (mentally and physically), and will more than likely quite the program. Since one of the major goals of an exercise program is to make it not only intense enough to see some positive results, but also to make it enjoyable enough to where it becomes a part of an individual's regular routine.

A substantial amount of evidence has been found to indicate that the number of times per week that the athlete trains is the measure of frequency. A training programme with a varied frequency of two, three and four days per week over a period of six to eight weeks may be sufficient to produce significant training effect.
Frequencies of training involves period assessment of the athletes status and progress. Training usually varies regular increase in the difficulty of task performance. Frequencies of training suggests some form of gradual increase in performance output over an extended period of time. Most kind of training essentials trait repetitions of the same original movements. Any invariable training implies hard work. Frequency of training should result in a level of personal fitness and associated with good health.

Hayward (1991) stated that the frequency of the exercise sessions depends in part on the health and fitness level of the individual. Normal, sedentary individuals should exercise a minimum of 3 times a week to produce significant change. As the fitness level increases, however the frequency should be increased to 5 times a week for continued improvement. It may be maintained by exercising 2 to 4 days a week, providing the intensity and duration of work outs as similar to that used to achieve the current fitness level.

Once a regular exercise routine has been established and the work out have become enjoyable, then the frequency of workouts may be extended to more than three to five days per week. One of the major goals of an exercise programme is to make it not only intensive enough to see some positive results, but also to make it enjoyable enough to where it becomes a part of an individuals regular routine.

Pollock (1988) stated that exercise should be performed on a regular basis from three to five days per week. Although programme of sufficient intensity and duration show some cardiorespiratory improvements with a frequency less than three days per week, little or no body weight or fat loss is found. Also improvement in cardiorespiratory endurance is only minimal to modest in programs of less than three days per week. Participants in one or two days per week programme often complain that the work out session are too intermittent and break the continuity of the training regimen.
1.4. DENSITY OF TRAINING

Density is the rest period during the training. Athletes cannot work continuously without a break throughout a training session unless the intensity of the exercise is relatively very low. Generally, the lower the intensity of exercise per unit of time the shorter the rest periods. The athletes heart rate is normally used for determining the length of rest between the individual sets and the series of exercise. According to research in exercise physiology depending upon the fitness level of the athlete, after an incomplete recovery period of about 30 to 180 sec., the pulse rate may drop to about 140 to 120 beats/min.

If the training activity is done with pauses in between, then the intensity is affected to a large extent by the density. The density characterises, the temporal relationship between load and recovery phases in a training session. Most commonly, it is referred to as the rest period in between two motor stimuli. If more stimuli are given in certain time period, then the training is more dense, ie. the density is high. The density is determined by the aim and objective of the training activity. The role of density is two fold.

a. The fatigue over in the pause
b. The adaptation process is started

Optimum density ensures the effectiveness of load and prevents premature exhaustion.

1.5. SPEED

Speed ability primarily signifies the ability to execute motor movements with high speed. These movements may be cyclic in nature.

From the general point of view we can have five type of speed abilities such as reaction ability, movement speed, acceleration ability, locomotion ability and speed endurance.
The factors which determine speed performance are mobility of the nervous system, explosive strength technique, biochemical reserves and metabolic power flexibility and psychic factors.

As far as the sprinting speed is concerned, it is generally accepted that it depends on an optimal combination of stride length and stride frequency. There are two most important factors in improving sprinting speed, namely stride length and the rate and efficiency of leg movements.

Sprint performance also depends a great deal on the relative muscular strength. In the 100 metres the relative strength level of leg extensors and flexors, ankle flexors and hip extensors and flexors are of particular importance.

It is a well known fact that the two biomechanical factors that determine running speed are stride length and stride frequency. The world class sprinters were found to have both a longer stride length and a faster stride frequency than other athletes.

Recent research has also indicated that the sprinting ability could be predicted through an analysis of the number of white and red muscles fibers in a bundle of muscle and as well as finding the sub-maximal strength of the calf muscles (by using the lactic analyser with a treadmill) However these facilities might not be available in all places so some kind of alternative prediction had become inevitable to predict sprinting ability.

1.6. LEG EXPLOSIVE POWER

Barrow (1979) stated that explosive power is the capacity of an individual to bring into play maximum muscle contraction at the fastest rate of speed.

Explosive power is a highly specific motor ability. The explosive power performance is always coupled with the specific load and movement structure of an exercise or motor action.
The explosive power performance depends largely on the muscle cross section, contraction speed and inter and intra muscular coordination. Depending on the magnitude of resistance and the specificity of movements it has a different nature in different sports. An improvement in maximum strength automatically does not lead to an improvement in explosive strength. Special exercises are needed to ensure this conversion. To improve explosive power, the following adjustments should be made.

1. The magnitude of resistance should be selected according to the nature of sports.
2. Exercises resembling the competition activity should be used.
3. Stress during the exercise should be a speed of movement with proper movement execution.

1.7. RESTING PULSE RATE

Khanna and Jeyaprakash (1990) said that, during ventricular contraction, blood is ejected into the arteries with a pressure and this pressure wave is transmitted throughout the arterial system which can be felt easily in superficial arteries. The number of pressure wave per minute felt at the arteries is called pulse rate.

Training leads to decrease in the resting pulse rate. Normally, it is about 70-80 beats per minute. For well trained persons, it is found to be as low as 40-50 beats per minute. Normally pulse rate and heart rate remain the same.

Berger (1982) observed that at rest, heart rate is about 75 for non athletes and 53 for athletes who train primarily aerobically. The decreased HR at rest for athletes is a consequence of physical training that is carried out continuously and over a long time span.

According to Pearce (1985), pulse rate is actually the frequency of pressure waves (waves per minute) propagated along the peripheral arteries such as carotid or radial arteries. The pulse rate can be easily measured during and after the
activity to assess the internal load during the activity and to assess the rate of recovery after the activity.

The pulse rate in normal persons are affected by age, body size, body position, food intake, time of day, emotions and physical activity. Most observations have shown that the pulse rate is definitely affected by body position. The rate is lowest in lying, higher in sitting and highest in standing. The extent of variation, however differs with the subject.

Astrand and Rodhal (1977) brought out the difference between heart rate and pulse rate. Heart rate (HR) is the number of ventricular beats per minute as counted from records of electro cardiogram or blood pressure curves. The heart rate can also easily be determined by auscultation with a stethoscope or by palpitation over the heart, both during rest and exercise. Pulse rate is the frequency of pressure waves propagated along the peripheral arteries such as the carotid or radial arteries. In normal healthy individuals, pulse rate and heart rate are identical but this is not necessarily so in patients with arrhythmias.

1.8. ANAEROBIC POWER

Hardayal Singh (1987) stated that anaerobic power is the capacity of organism to work in the absence of oxygen. In the absence of oxygen the energy production for the muscle contractions can take place in two ways.

a. Through splitting of ATP and CP (i.e phosphogens), the mechanism of energy production called alactacid metabolism as it does not lead to formation of lactic acid.

b. By glycolysis of muscle glycogen (i.e carbohydrate), which is also called lactacid mechanism it results in the formation of lactic acid.

The anaerobic capacity depends to a significant extent on aerobic capacity. During speed, endurance and short time endurance performance, the total energy required is produced by a certain combination of alactacid, lactacid and oxydative metabolic processes.
Anaerobic power is expressed as the ability to jump, sprint, putt the shot, throw the javelin, or perform fast starts. The development of anaerobic power is related to muscular strength and especially to the amount of the rate of utilisation of the adenosine triphosphate and creatine phosphate (ATP-CP) system. However the effects of anaerobic training on skeletal muscle have not been extensively studied either in animals or in humans, Fox and Bower (1993).

Numila, Amero and Rusko (1992) had investigated whether the sprint training induced changes in the different components of anaerobic performance capacity that can be determined by the maximal anaerobic running power test. During the training period VO₂ max increased and the correlation analysis revealed that the high volume of lactic speed endurance training influenced negatively VO₂ max and blood lactate concentration. The volume of interval training at low intensity correlated positively with the change of VO₂ max and the volume of speed training was found to be advantageous for the changes in VO₂ max. It was concluded that the results of the test reflect that the sprint training induced changes in the anaerobic performance capacity.

1.9. FITNESS AND PERFORMANCE

Gallahne (1993) stated that balance, co-ordination, agility, speed of movement and power are among the most frequently cited components of the performance related fitness. Childrens' health related fitness play an important role in the development of total fitness.

Renstrom (1993) stated that children do not perform as anaerobically well as adults. This is probably related to child inability to utilize glycogen as well as the adult. While training does not substantially improve VO₂ max in children, performance can definitely be enhanced.

1.9.1. Athletic Performance

The nature and structure of sports performance determine to a great extent, means and method of training as well as the total planning, organisation, implementation
and assessment of training. The knowledge about the nature and structure of sports performance must be considered as the first and perhaps the most important step towards the successful preparation of sportsmen for higher performance.

Sport performance as the unity of executions and result of a sport action or a complex sequence of actions measured or evaluated according to socially determined and agreed norms.

Athletic performance is the physical, physiological, mechanical and physical structure of the motor action or actions done during the competition.

Performance capacity is a complex performance prerequisite which is divided into the following groups:

a. Technique; consisting of skills, flexibility and co-ordination
b. Personality; consisting of beliefs, values, interests, attitudes, temperament, mental capacity, personality traits and habits etc.,
c. Condition; consisting of strength, speed, endurance and their complex forms.
d. Tactics; consisting of tactical knowledge, tactical skills and ability.
e. Constitution; consisting of physique, body weight and height, size, width and length of body parts, body fat, lean body mass and stability of bones, joints, etc.,

Mc Ardle et. al (1994) stated that in training for a particular sport with performance goal, the activity must be carefully evaluated in terms of its energy components. The major objective in exercise training is to cause biological adaptation to improve performance in specific tasks. Attention is focused on factors such as frequency and length of workouts, type of training, speed, intensity, duration and repetition of the activity, and appropriate competition. Although these factors vary depending on the performance goal, it is possible to identify several principles of physiologic conditioning common to the performance classification.
1.9.2. 400 Metres Running Performance

The 400 metres sprint race, involves a sustained sprint and as such it is very demanding test of speed, endurance, strength, pace judgement and courage. Thus, it needs the physical strength and endurance to perform at top speed.

The 400 metres dash is an endurance sprint incorporating the speed of the sprinter and the endurance of the half miler. The 400 metres is an oxygen deficient event and the energy used during the 400 metres run is derived mainly from breakdown of high energy phosphate compounds supplied through the ATP, PC and lactic acid system. Training emphasis should be on maximizing development of each of these systems.

1.10. OBJECTIVES OF THE STUDY

One way to effectively maintain the benefits gained from bench step training would be to train on a regular basis throughout the year after year. However this remedy is least desirable from the stand point of economy of time on the part of the participant. With this in mind, the investigator has desired to determine the effect of varied intensities, frequencies and densities of bench step training on selected motor ability components, physiological variables and the performance of 400 metres run of college men students.

The following are the main objectives of this study:

1. To import Bench step training to the college students of our country.
2. To vary the intensities of Bench step training.
3. To vary the frequencies of Bench step training.
4. To vary the densities of Bench step training.
5. To determine the optimum intensity, frequency and density of Bench step training for achieving the best performance.
6. To develop a scientific programme that is to be carried out sequentially and systematically.
7. To study the changes in the following variables before and after training.
1. Speed
2. Leg explosive power
3. Resting pulse rate
4. Anaerobic power
5. 400 metres running performance.

1.11. STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effects of varied intensities, frequencies and densities of bench step training on selected motor ability components, physiological variables and performance in 400 metres run of college men students.

1.12. SIGNIFICANCE OF THE STUDY

The present study is significant for the following aspects.

1. This study would be useful to identify the desirable changes in the selected motor ability, physiological variables of college men students due to bench step training.

2. The findings of the study will provide guidance to physical education teachers and coaches to prepare bench step training schedule for specific events on the basis of the physical and physiological capacity of the athletes.

3. The findings of the study will add to the quantum of knowledge in the area of training methods and exercise physiology.

1.13. HYPOTHESIS

On the basis of the literatures, research findings, expert opinions and the scholar's own apprehension of the problem, the following hypotheses were formulated with regard to the present investigation.

1. The first hypothesis stated that a) 35 steps per minute with 4 days frequency and 2 minutes density, b) 35 steps per minute with 4 days frequency and 3 minutes density, c) 35 steps per minute with 2 days frequency and 2 minutes
density, d) 35 steps per minute with 2 days frequency and 3 minutes density, e) 30 steps per minute with 4 days frequency and 2 minutes density, f) 30 steps per minute with 4 days frequency and 3 minutes density, g) 30 steps per minute with 2 days frequency and 2 minutes density, h) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training, would significantly improve the selected dependent variables, such as speed, leg explosive power, resting pulse rate, anaerobic power and 400 metres running performance of college men students.

2. The second hypothesis stated that 35 steps per minute with 4 days frequency and 2 minutes density of bench step training would significantly improve the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running, greater than, a) 35 steps per minute with 4 days frequency and 3 minutes density, b) 35 steps per minute with 2 days frequency and 2 minutes density, c) 35 steps per minute with 2 days frequency and 3 minutes density, d) 30 steps per minute with 4 days frequency and 2 minutes density, e) 30 steps per minute with 4 days frequency and 3 minutes density, f) 30 steps per minute with 2 days frequency and 2 minutes density and g) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

3. The third hypothesis stated that 35 steps per minute with 4 days frequency and 3 minutes density of bench step training would significantly improve the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running, greater than bench step training of a) 35 steps per minute with 2 days frequency and 2 minutes density, b) 35 steps per minute with 2 days frequency and 3 minutes density, c) 30 steps per minute with 4 days frequency and 2 minutes density, d) 30 steps per minute with 4 days frequency and 3 minutes density, e) 30 steps per minute with 2 days frequency and 2 minutes density, f) 30 steps per minute with 2 days frequency and 3 minutes density.
4. The fourth hypothesis stated that the significant improvement effected by 35 steps per minute with 2 days frequency and 2 minutes density of bench step training on the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running would be greater than those achieved by a) 35 steps per minute with 2 days frequency and 3 minutes density, b) 30 steps per minute with 4 days frequency and 2 minutes density, c) 30 steps per minute with 4 days frequency and 3 minutes density, d) 30 steps per minute with 2 days frequency and 2 minutes density, e) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

5. The fifth hypothesis stated that the effect of 35 steps per minute with 2 days frequency and 3 minutes density of bench step training on the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running would be significantly greater than that of a) 30 steps per minute with 4 days frequency and 2 minutes density, b) 30 steps per minute with 4 days frequency and 3 minutes density, c) 30 steps per minute with 2 days frequency and 2 minutes density and d) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

6. The sixth hypothesis stated that 30 steps per minute with 4 days frequency and 2 minutes density of bench step training would significantly improve the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running, greater than , a) 30 steps per minute with 4 days frequency and 3 minutes density, b) 30 steps per minute with 2 days frequency and 2 minutes density and c) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

7. The seventh hypothesis stated that 30 steps per minute with 4 days frequency and 3 minutes density of bench step training would significantly improve the selected dependent variables such as speed, leg explosive
power, resting pulse rate, anaerobic power and performance of 400 metres running, greater than a) 30 steps per minute with 2 days frequency and 2 minutes density and b) 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

8. The eighth hypothesis stated that 30 steps per minute with 2 days frequency and 2 minutes density of bench step training would significantly improve the selected dependent variables such as speed, leg explosive power, resting pulse rate, anaerobic power and performance of 400 metres running, greater than 30 steps per minute with 2 days frequency and 3 minutes density of bench step training.

1.14. DELIMITATIONS

For the present study, the subjects were delimited to one hundred and sixty college men students who were selected at random and their ages were between 18 and 25 years.

To achieve the high performance in sports, an athlete should know the exact intensity, frequency and density of bench step training. Keeping the above facts in mind the researcher has selected the following variables in this study.

1.14.1. Dependent Variables

On the basis of literatures and research finding, the following variables were selected.

Motor Ability Components

1. Speed
2. Leg Explosive Power
Physiological Variables

1. Resting Pulse Rate
2. Anaerobic Power

Performance Variable

1. 400 metres running performance

1.14.2. Independent Variables

Varied Intensities

a. High intensity (35 steps per minute)
b. Moderate intensity (30 steps per minute)

Varied Frequencies

a. 2 days frequency
b. 4 days frequency

Varied Densities

a. 2 minutes rest density
b. 3 minutes rest density

1.15. LIMITATIONS

The present study considered the following factors as its limitations.

1. Climatic condition
2. Nutritional factors
3. Daily routine
4. Time of testing and
5. Physiological factors
1.16. DEFINITION OF THE TERMS

1.16.1. Bench Step Exercise

Bench step exercise is done by stepping up and down on a bench at a specified rate.

1.16.2. Training

Training has been explained as a programme of exercise designed to improve the skills and increase the energy capacities of an athlete for a particular event. Fox (1984)

1.16.3. Speed

It is the capacity of the individual to perform successive movements of the same pattern at a faster rate. Gothi (1993)

1.16.4. Explosive Power

It is the ability to release maximum muscular force in the shortest time as in executing a standing broad jump. Baumgartner (1987)

1.16.5. Resting Pulse Rate

Morehouse and Miller (1976) have defined resting pulse rate as the distension of the arterial walls at the beginning of systolic ejection of blood which is not confined to aorta but travels down the arteries as a wave followed by a wave of recoil. The arteries that lie close to the body such as radial artery of the wrist, the arrival of the wave of distension and subsequent recoil may be felt as a distinct throw pulse which offers a convenient method of counting the pulse rate.
1.16.6. Anaerobic Power

Willmore et al. (1988) defined anaerobic power as the peak power output attained in a short duration test of usually less than or equal to thirty seconds.

1.16.7. 400 Metres Running Performance

The best performance of an individual to cover 400 metres distance will be taken as performance variables in 400 metres run.

1.16.8. Intensity

Intensity is the rate of doing work. In other words it is the part at which physical activity is done. Hardayal Singh (1984)

1.16.9. High Intensity

In this study 35 steps/minute in step bench was considered as high intensity as it increases the exercise pulse 90% of the maximum among college men students.

1.16.10. Moderate Intensity

In this study 30 steps/minute in step bench was considered as moderate intensity as it increases the exercise pulse rate 70% of the maximum among college men students.

1.16.11. Frequency

The number of times per week that the athlete trains is the measure of frequency, a training program with frequency of three or five times per week over a period of six to eight weeks may be sufficient to produce significant training effect. Hardayal Singh (1984).
1.16.12. High Frequency

In this study 4 days per week training was considered as high frequency of training.

1.16.13. Low Frequency

In this study 2 days per week training was considered as low frequency of training.

1.16.14. Density

The rest period in between the sets of bench step training was considered as density.

1.16.15. High Density

Two minutes rest in between the sets of bench step training was considered as high density in this study.

1.16.16. Low Density

Three minutes rest in between the sets of bench step training was considered as low density in this study.