CHAPTER - I

INTRODUCTION

Physical activity is as old as human life. A primitive man, even watchful of his foes, had to keep himself in a very good physical condition for his survival. Therefore the primitive man had to be a good runner, thrower and swimmer for his existence. Otherwise also an ideal man should be strong, healthy, intelligent and active. Sport's teaches us a sense of teamwork to play properly and with true sportsmanship. Sports build and mould the character of a person. Games also mould our character.

Physical education emphasizes the importance of physical activities as they are directly related to growth and development. Movement is the basis for life and growth, which is realized through physical activity sports and games. It is a natural and an inborn quality of a child to involve himself in physical activities right from the day of his birth.

It is a fact that games and sports have become very important for successful life. Modern life demands a very high level of participation in games and other physical activities. Games and sports enable us to keep fit and relaxed. They also give us joy and a sense of fulfillment.

“A sound body and sound mind are the man’s most precious possessions” (Hooks G 1974). It is only sports activities through which we build up a good and sound body, which is the determining,
factor for a sound mind. A sick person is not only a liability for himself but also for the society and the nation as whole.

Physical education is an educational process that has as its aim the improvement of human performance and enhancement of human development, through the medium of physical activities selected to realize this outcome. It includes the acquisition and refinement of motor skills, the development and maintenance of fitness for optimal health and well being, the attainment of knowledge about physical activities and exercises, and the development of positive attitudes.

Physical education and sports, being and integral part of education, have also experienced the impact of scientific advancement. Now the sportsmen have been able to give outstanding performances because of involvement of new scientifically substantiated training methods and means of execution of sports exercises such as sports techniques and tactics, improvement of sports gears and equipment as well as components and conditions of the system of sports training (Powell John T. 1983).

In sports, successful performance in competition depends substantially on the physical characteristics, body composition, muscular performance, neuromuscular capability and mental ability of the players.

Morphological characteristics may become important in determining success in games and it can contribute a great deal in providing distinct physical advantages according to the nature of the game. Apart from the body size, and proportions, body composition is
essential for athletic competition. Superfluous body fat acts as dead weight in activities when body mass must be lifted repeatedly against gravity during play, so it reduces the ability to perform many activities requiring jumping or moving quickly.

Fitness comprises many different components, which must be viewed in relation to individual characteristics, needs, goals, and tasks that must be performed. AAHPERED and many other professionals classify the fitness components into two categories, those pertaining to motor –skill performance. Health fitness is concerned with living whereas motor –skill performance fitness is concerned with performing skills better and more efficiently.

Motor fitness is actually broader and less definitive in scope. It includes both physical fitness and motor ability factors, and includes not only strength and endurance components, but also factor of speed, power and agility. The seven components used to measure motor fitness are muscular strength, muscular endurance, circulatory- respiratory endurance, muscular power, agility, speed and flexibility.

In sports, effective performance requires sufficient amount of ability to co-ordinate effectively the actions of the different muscles used in a bodily movement. Exact neuromuscular control is needed to assure success. The performance expert’s claim that skill, is the most important factor in performance. Basically skill is a result of the teamwork of the nervous and muscular system, since the muscles contract at specified times and with certain amount of force as dictated by nerve impulses.
Competitive sports have gained tremendous importance and influence in the lives of people from all walks of life around the world. Developed countries are spending billions and trillions for the training and preparation of sports persons who are participating in international competitions. Decades ago winning a place in Olympics or similar competitions was a matter of great prestige and pride, but now besides that the entire sports world is commercialised and it has reached the status of a prospering industry and the organisers are making huge profits through various ways and means. Prospective sports persons are the beneficiaries of many lucrative offers from governments; quasi-government and private sector establishments and such benefits have made the performance sports arenas highly competitive. Naturally this has paved the way for the establishment of sports training in a more systematic, organised and scientific manner. As a result, the theory and methods of training for different sports has undergone rapid development in the last few decades in some of the developed countries, especially in the former G. D. R and U. S. S. R.

Sports training is the process of preparation of sports persons based on scientific and pedagogical principles for higher performance. Sports performance is the result and expression of the total personality of sports men and women. In addition to sports fitness, technique and tactics, sports persons must possess certain cognitive, volitional and perceptual abilities, certain personality traits, habits and above all positive beliefs, values, attitudes and interests for training also aims at better education of sports persons. The systematic training in
almost all the sports has to start in childhood itself. The pedagogical aspect of sports training comes into sharp focus.

Sports performance is a difficult and complex term and cannot be defined easily. The limiting factor is the multi-dimensional nature of sports performance. It is like any other type of human performance, a highly complex process and is a product of several internal and external factors encompassing all the aspects of human personality. Thiess and Schnabel (1987) have defined sports performance as the unity of execution and result of a sports action or a complex sequence of actions measured or evaluated according to socially determined and agreed norms. The actual performance is the psycho-sociological process of doing some actions of tackling some sports tasks. High performances are achieved after prolonged periods of training with the direct or indirect support and blessings of the society. Athletes/sports persons should inculcate the spirit of sports conscious society and this society will makes them perform to the peak of their capacity in international competitions.

Superior sports performance is possible after a systematic and prolonged scientific training of about 8 to 10 years and that means by then sports persons must have attained the age of about 18 to 20 years. It is important to note that training for sports performance which starts at an early age should be streamlined in accordance with the principles of human growth and development, especially motor development to avoid harmful effects of biological growth. From sports and physical education point of view three aspects of growth and development are important and these are (a) physical and
physiological aspects, (b) psychological aspect, (c) motor development aspect (Singh, 1991).

Physical and physiological aspects deal with the developmental changes taking place in height, weight, body composition, body proportions and the vital internal organs. Actually the systematic growth and development of internal organs like heart, lungs, brain, liver etc. and the associated systems in the body forms the basis of biological development and have direct influence on motor development. Psychological and social developments of the sports persons are very important and play a key role in formation of the personality, behaviour and interaction within the society. Motor development, the vital component for sports and physical education activities consists of motor abilities, technical and tactical skills and abilities and motor performance from birth to adolescence. Study of human growth and development deals with various disciplines of science and is a complex process. Motor development is one of the aspects, giving prominence to the development pertaining to the formation of components required for performing sports tasks.

Several studies have been conducted on the motor development of European children and youth with a specific purpose of imparting scientific sports training in those countries. Coaches and teachers for spotting talent and preparation of sports persons to complete in international competitions extensively use this branch of knowledge. Stemmeler (1977), Ludwig and Hirtz (1985) reported that growth and development is not a uniform process but is characterised by the development of various parameters at different velocities at different
stages. Some abilities show faster development in the early childhood and some in adolescence.

A study of motor development of Indian children and youth is still in its infancy. Till recently training of sports persons was done mainly in accordance with the conventional and outdated literature received form foreign countries. Major works in this field have been published either in German or Russian and the language barrier formed one of the reasons, which prevented the spread of this branch of knowledge to other parts of the world. Very few studies have been conducted on growth and development of Indian children and youth (Singh, 1964; khajuria, 1968; Bansal, 1969; Sindhu, 1970; Sharma and Shukla, 1980; Kansal, 1981; Sachdev, 1991; Joon, 1983; and Singh, 1986). In these studies, an attempt has been made to study the development of motor abilities of Indian children.

Sports performance can be enhanced through training and competition. Performance not only depends upon the physiological, psychological, sociological aspects but more on the physical characteristics of the individual. A recent trend is to improve the physical fitness standards through scientific and systematic training. In the present world of sports, physical fitness, factors have been regarded as one of the important measure for achieving elite level of sports performance.

The world of games and sports has crossed many milestones, as a result of different achievements in general and their application in the field of sports in particular. Scientific investigations into the performance of sportsmen have been playing an increasingly
important role in the training of athletes in the scientific way to attain excellence in performance in different spheres of sports. Athletes concentrate on the development of speed, flexibility, strength, agility and endurance, as a part of preparation in their respective sports. 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 have most beneficial means of training (Whithead. N, 1976).

Training is the main component and the basic form of preparing the athlete. It is a systematically planned preparation with the help of the exercise methods, which realizes the main factors of influencing athlete's progress. The content of training includes all the basic types of preparation of the sportsman, physical, technical, tactical and psychological. Through systematic training the athlete's fitness level and his acquisition of vital knowledge and skills are improved (Barar B. S, 1984).

To be able to succeed in international competitions and to attain high performance one needs superior physical fitness. Gone are the days when natural ability, good physique and participation in the chosen activity were considered enough for success in competitions. To-day it is not so, present day athletes/ players desirous of attaining international success in games/ sports put in extreme hard work which involves three to four hours or even more of concentrated schedule per day in a six day week. This schedule may continue for five to seven years with very little or no break in between. To achieve superior physical fitness participation in the event/ game is not enough; there are innumerable good sets and a variety of
fitness programs that are required for today’s high performance (Singh K, 1983).

Sports performance over the past century can be attributed to refinement of the training methods used by coaches and athletes. Such methods have involved program for improving both aerobic (endurance) and anaerobic (sprint) energy capacities and performances as a result.

In the light of the facts and the explanation covered in the above-mentioned paragraphs, it is fair to conclude that the physical education and its periphery have proliferated. Those correlated factor points, which are directly or indirectly determining is influencing the training of this subject under study. At the center of training is a complex subject represented by physical, physiological and anthropometric parameters.

The relationship of physical education and sports has been amply described. So as to make them complementary and supplementary for the sports performance, methodology and technical aspects have also been considered to contribute to sports promotion without appropriate methods of training. An effective training programme cannot be formulated. Therefore various methods of training have been discussed for the development of physical, physiological, technical and tactical aspects of training. These methods in the recent past have been changing from time to time in the light of the scientific research conducted by sports scientists.
The training and its effect on physical permutes has also been considered. The training cannot be purposefully carried out, if the physiological response of the body is not taken into consideration. On one side the load plays an important role to quantify the amount of efforts and on the other hand if the recovery is not properly facilitated, desired results cannot be achieved. Therefore the study of physiology occupies an important place and continues to be a part of the long term training programme, because performance is gradually enhanced in periodically and phased manner.

The psychological aspects have also been explained to understand their role in deciding the final performance of the players. These factors start functioning right from the first day of training until the last day of performance. Therefore the importance of the psychological factors must be known to the trainers and the players factors like; readiness, confidence, motivation, fighting sprit, interest form a part of the total training to be carried out in a given time.

Methods of sports training are the methods of formulation of training activity of sportsmen and constitute purposeful, planned and effective carrying out and formulation of process of performance development and education in training. The methods of training characterize the ways and methodical procedures for imparting and acquiring of training demands. In training there are different sets of methods for different training tasks e.g. methods of conditioning, methods of technique training, methods of tactical training and methods of intellectual development. Basic methods of conditioning are continuous, interval and repetition method (Singh, H. 1991).
According to Dr Hardayal (1991) there are three basic methods of conditioning. They are continuous method, interval method and repetition method.

CONTINUOUS METHOD

In this method an exercise is done for long time without any break or pause. Because of the long duration of the work the intensity is low. The continuous method has four variations. They are slow continuous method, fast continuous method, variable pace method, and fartlek method.

Matt Roberts (2002) explains about continuous training by giving the name of constant pace training. Working for extended periods at a steady pace, or at least keeping heart rate with in a small working zone, is called constant pace training. It is a training technique that builds endurance and helps the body to use oxygen more efficiently. It increases lung capacity and local muscle endurance.

While you will burn marginally more fat with interval training, constant pace training is crucial for building a good base level of fitness. This will improve your performance in any field of sports or exercise.

INTERVAL METHOD

According Hardayal (1991) in this method the exercise is done at relatively higher intensity with intervals of incomplete recovery. Interval method is based on following principle: work should be done
with sufficient speed and duration so that the heart rate goes up to 180 beat/min. after this there should be recovery period and when the heart rate comes down 120 to 130 beats/min the work should be started again. The training load in interval method, therefore, can be controlled by repeatedly checking the heart rate.

The effect of interval method is determined by the variables of interval method, which are the following.

- Speed of work
- Duration of work
- Duration of recovery
- Number of repetitions
- Nature of recovery

By proper manipulation of the above mentioned variables the interval method can be used in several ways each having a different physiological and training effect. However, from general point of view interval method is of two types: Intensive interval method and extensive interval method. In intensive interval method the intensity is from 80-90%, where as in extensive interval method the intensity is from 60-80%.

**IMPORTANCE OF VARIABLES**

- **Body Weight:** - Athletes body size, build and composition play major role in determining athletic success. Of primary concern is the athletics fat mass and fat free mass. The ideal body type varies with each sport. The endurance runners strive for leanness, minimising the load carried during a distance run, but the summo
wrestlers try hard to maximise body weight, because the tradition of the sport dictates that “bigger is better”. Athletes of various weights can participate successfully in some sports, such as football, depending on the position they play. Yet other sports, such as wrestling, set rigid weight standards that often force athletes to shed large amounts of weight in a short time.

- **Percentage of Body Fat:** - The fat is an inner substance and it limits athletic performance representing dead weight that must be carried by the athlete. Gaining weight for shorter persons processes a unique problem that is not easily resolved. Hence weight gain for sports persons however must be in form of lean body weight, especially muscles mass. Some of the popular methods available for the assessment of body fat are (a – hydrostatic weighing and (b- skin fold measurement of subcutaneous fat using a skin fold calliper. Due to the administrative feasibility skin fold measurement is the popular method of body fat assessment among sports scientists

- **Strength:** - In sports activities some amount of resistance (if not external then one's own body weight) has to be overcome. Strength therefore, is an important factor on which the sports performance depends. Depending upon the magnitude and type of resistance to be tackled in various sports, the sportsman from 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 co-ordinative abilities are impossible if the sportsman lacks the requisite amount of strength.

Strength has the first and foremost place among motor abilities because strength means to apply force implies its importance to sports performance. It is the result of muscular contractions and in sports moments its always appears in some combination with the duration and speed of movement. Depending upon its contribution to other abilities strength is classified into (a) maximum strength- maximum strength application, (b) explosive strength- strength application with speed, (c) strength endurance- strength application under condition of fatigue, (Singh, 1991)

- **Endurance**: Endurance is a very important ability for good performance in sports. In India it is usually neglected in training in case of track and field, hockey, football etc. Endurance has been wrongly understood to be important only in those sports in which the competitive activity lasts without break for many minutes e.g., long distance running and swimming. In reality, all the sportsmen irrespective of their sports need a fairly good level of endurance. Its importance is summarised in the following points:
  - Endurance enables the sportsman to maintain optimum pace and tempo during the competition.
  - Endurance is important for ensuring good quality of the technical skills, e.g., accuracy, precision, rhythm etc.
  - The tactical efficiency in long duration sports depends largely upon the endurance of the sportsman. A football or
basketball player, having good endurance can recover faster after short bursts of activity during the competition.

- The ability to recover faster in between the training sessions is also dependent on endurance. Sportsman having good endurance, irrespective of their sports can, therefore, take higher weekly loads, which are necessary for the improvement of performance.

Endurance work can be broadly classified into two categories: general and specific. The goal of general endurance work is to develop and improve aerobic capacity. There are several ways to achieve this, including continues easy running, fart-lek running, and games with continuous movement, tempo intervals and circuit training. The goal of specific endurance training is to develop the type of endurance, which is the most consistent with the competitive demands of the various sprint events. All sprint races require endurance to some extent and in different forms. The sort sprinters require a well develop a lactic –anaerobic endurance. Examples of workouts to improve this type of endurance include –running 4-8 repetitions of 80-150 meters performed at intensity level of 90%, with 1-5 minutes recovery, or –running 3-4 sets of 3-5 repetitions of 50-80 meters performed at a intensity level of 90-95%, 2-4 minutes of recovery. The long sprinters require a great development the lactic anaerobic system.

- **Speed:** Speed is a complex motor ability. Theiss and Schnabel(1987) define speed as the performance prerequisite to do motor action under given conditions (movement task, external
factors, individual prerequisites in minimum of time.) Speed ability is markedly dependent on the functions of central nerves system; gives little scope for training and improvement. However in the field of sports, speed combined with ingredients during its application, can be improved through training. Reaction ability, explosive strength, technique, flexibility and psychological factors also play a major role in the speed performance.

The requirement of speed in different sports is beyond question. The tempo of the sports is set not only by how fast an individual player runs by how quickly they acceding more required in sports field and how quick manage to control the situation and over take an opponent without any waste of time. Thus with the help of all the techniques and skill training an individual can improve his speed. Therefore, it is needless to further elaborate the requirement of speed for better sports performance. The present research project keeps this view in mind.

- **Agility:** It is a very complex motor ability. Agility is often represented by the term manoeuvrability. Extensive studies conducted on agility in the last few decades show that is a complex of several abilities (Hirtz, 1964). In the performance sports literature the word agility is replaced with co- ordinative abilities since all the known component of agility are primarily dependent on the motor control and regulation processes of the central nerves system. Blume (1978) stated that there are seven co-coordinative abilities, which are important in sports. They are orientation
ability, coupling ability, differentiation ability, balance ability, rhythm ability, reaction ability and adaptation ability. The term motor co-ordination is something used as equivalent to agility or coordinative abilities.

- **Flexibility**: The range of motion in a given joint or combination of joint often expresses Flexibility; it depends on stretchability of the muscles and ligaments around the joint. According to recent concept flexibility depends partly on energy liberation processes and partly on the co-ordinative processes of the centre nerves system (Meinel and Schnabel)

The results derived from the regular period of training as practical means of training of adopting the organism to certain specific demands of sports. The systems, which have been reviewed in this, and proposed are all involved in this purpose, are all involved in the adaptation process or permit adaptation to take place. Some specific effects of training, which illustrate adaptation of the physio-physical system by the increase or decrease of certain functional capacities are listed as follows:

- **Resting Heart Rate**: The heart rate at rest can decrease markedly as a result of training. If you are a sedentary individual with an initial resting heart rate 80 beats/min, your heart rate can decrease by approximately 1 beat/min each week for the first few weeks of training. So, after 10 weeks of moderate endurance training your resting heart rate could decrease 80 to 70 beat/min. The actual mechanism responsible for this decrease is not entirely
known, but training appears to increase parasympathetic activity in the heart by decreasing sympathetic activity (Willmore & Costill, 2004).

Evidence is available to show that heart muscle increases in size through use; the stroke volume of a trained athlete is more compared to an untrained athlete. The pulse rate at resting condition (basal) in less in trained compared to untrained and it is also evident from the available literature that resulting pulse rate is much more less in case of trained than that of an untrained individual.

**Respiration Rate:** Respiratory system importance is because of the demand of oxygen increase. In response to this demand for more oxygen the rate and depth of breathing is immediately increased. Emotional and environmental factors before exercise also influence the increase in rate of breathing. Along with increased inhalation of air, gas exchanges in the air sacs or alveoli, which are the terminals of the respiratory system, are also speeded up. As a consequence of the cumulative effect of these functions and reactions, the temperature of expired air and body increases.

Karpovich (1971), in his work remarks that as a result of training, the bone marrow becomes redder, indicating an increase in the number of red corpuscles in the trained individual. The training also affects the respiratory system by developing all functions, resulting better pulmonary ventilation. His investigation also reveals that muscular system’s adaptation occurs due to training and it improves thickness and strength of the muscle, the size of the muscle improves endurance and better neuro-muscular co-ordination. These
findings are also suggested by Dick's investigation. It should be said here, however, that no one form of training would affect all of these adaptations.

- **Cardio-respiratory Endurance**: Willmore & Costill (2004) stresses the importance of Cardio-respiratory endurance as many people regard Cardio-respiratory endurance as the most important component of physical fitness. It is an athlete's major defence against fatigue. Low endurance capacity leads to fatigue, even in the more sedentary sports or activities. For any athlete, regardless of the sport or activity, fatigue represents a major deterrent to optimal performance. Even minor fatigue can hinder the athlete’s total performance. Some effects of excessive endurance training -
  - Muscular strength is decreased.
  - Reaction and movement times are prolonged.
  - Agility and neuromuscular co-ordination are reduced.
  - Whole-body movement speed is slowed.
  - Concentration and alertness are reduced.

- **Vital Capacity**: The volume of air that can be moved out of the lungs after a maximal inspiration is called vital capacity. It comprises tidal volume, inspiration reserve volume, and expiration résumé volume. This vital capacity equals 500-ml. (tidal volume) plus 1000ml. (Expiratory reserve volume), plus approximately 3000 ml. (inspiration reserve volume) for a total of 4500 ml. or 4.5 litres.

  Richard, A Brger, (1982) Vital capacity has been used in past as measure of physical fitness because it is related to Vo2 max, when Vo2 max was related to vital capacity among 190 individuals from the
age of 7 to 30 years, there was a relatively linear relationship. This occurred because vital capacity is highly related to body size and age and both are related to Vo2max. When vital capacity is expressed per unit of body weight, no apparent relationship exists between vital capacity and Cardio-vascular efficiency.

Astrands, Christenson, et.al (1970) for it seems to have large implications for the planning of training. Regimens, in one experiment a well-trained subjects was able to work for 30 minutes at very high work load (4.4liter O2/ minute) 14 alternating five seconds work with five seconds of rest. This appeared to be something like a steady state in that very little lactic acid accumulated. Even for a high-trained athlete, a workload of the size done continuously would result in a high level of blood lactate.

In another experiment subject alternating ran ten seconds and rested five seconds, for a total of 3 minutes and 6.67 km. His O2 intake for the 30 minutes period averaged 5.0 litre / minute. His actual O2 uptake for the 20 minutes of running was 101 litres and his uptake during the accumulated rest period was 49 litres. Subtracting a resting O2 consumption of 4.0 litres for the ten minutes for the rest from the total 49 litres leaves a tremendous recovery O2 requirement of 45 litres, which had been eliminated in some fashion during the five seconds rest periods. The largest O2 requirement ordinarily reported after continuous work varies from 15 to 20 litres of O2. These experimenters suggested that O2 is stored as oxymyohemoglobin in the muscles during the rest periods of support metabolism during the work periods without resorting to the anaerobic mechanisms. This is an interesting possibility and provides
a scientific basis for interval training of athletes. Indeed, there is a
now evidence that intermittent exercise contains both aerobic and
anaerobic capacity.

Champion performance that is not something that just
happens. A well organised systematic training, use of modern
facilities, experience of good coach and scientific back up ensures
high performance. For improvement of sports performance, numerous
factors contribute. Ones level of performance in a given sports
discipline is the result of harmonious development and integration of
several performance factors. Every possible effort should be made to
enhance the sports performance by giving due importance to all the
factors; however certain factors are stressed, as it is dominant.
Physique, motor abilities occupy a dominant position in the process
of building up high performance along with technical and tactical
abilities of sports man. Strength, endurance, speed, flexibility and co-
ordination are the basic physical performance components and these
components are basic prerequisites for human for human motor
actions. Each sport requires a different type of motor ability as a
result different type of training is required.

Numerous research studies have been conducted to ascertain
the components comprising physical performance. Most of these
studies have identified the same or similar components, although the
term selected to describe the components are not always the same.
The physical performance components that are identified by
researchers are strength, endurance, speed, flexibility, agility, co-
ordination and balance. These components are manifested through
the fundamental skills of running jumping, lifting, throwing or
holding which are inherent in men and are common to the
performance of all people since they make up the basic pattern of
movement.

Movements in sports and games are highly specific and are the
results of training an experience. Motor abilities are casual to
fundamental body movements and specific of sports skills. For
successful performance of a skill, components of motor ability
contribute independently and interdependently. The role of motor
abilities for successful sports performance cannot be disputed.
Strength, endurance, speed, flexibility, agility and co-ordinate
abilities are the prerequisites for motor actions in all the sports. The
improvement and maintenance of these components are very
important and significant in sports training. There is a good deal of
evidence that successful competitors in different sports possess
physique, strength, endurance, speed, flexibility and agility and are
responsibly distinct. The extent to which these abilities contribute to
the performance is different for each sport.

Strength, muscular endurance, Cardio-respiratory endurance,
speed, flexibility and co-ordination are the basic components of
physical performance components and these components are basic
prerequisites for human motor actions. Each sports discipline
requires a different type of motor ability because of which a different
type of training is required. In competitive sports, the team, which
possesses high level of physical quality, will have an edge over its
opponents. Players who are highly fit perform techniques more
efficiently than less fit players. A highly physically fit player will be
able to perform the skills from the beginning of the game until the
end of the game by maintaining high level of perfection in the execution of the skills and will not be fatigued soon. Conditioning program usually involves the basic elements of muscular strength, Cardio- respiratory endurance, flexibility and speed. Performing integrating patterns of movement with good co-ordination involves agility, balance, and speed and kinaesthetic sense. The term co-ordination concerns with the capacity to perform series of movements quickly, accurately with free flow of movements by an individual. It is a very complex ability, is closely related to motor ability. Coordination in movement execution is an essential prerequisite in any given sports. The rhythmic, accurate, quick and flawless coordinated technical movement is the reflection one’s ability to coordinated technical skill, which paves way for higher level of performance.

In this context, it will be worth while to investigate the effects of three conditioning programmes such as, continuous running, interval running and combination of continuous running and interval running with due consideration to other aspects of performance. That is why, an attempt has been made in this research work to explore this field to find out the effects of three training programme for physical, physiological and anthropometric adaptation process of the sports person.
STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effects of different conditioning programmes on Anthropometrical, Physical fitness and physiological variables on school-boys.

OBJECTIVES OF THE STUDY

The study has been focused to achieve the following objectives: -

1. To find out the effects of continuous running [Conditioning Program I] on anthropometrical, physical and physiological Variables.

2. To find out the effect of the interval running [conditioning program II] on anthropometrical, physical and physiological variables.

3. To find out the effect of combination of continuous running [conditioning program I] & interval running [conditioning program II] on Anthropometrical physical and physiological variables.

4. To know the comparative effects of continuous, interval and combination of continuous and interval training on anthropometrical, physical and physiological variables of school boys.

HYPOTHESES

The following were the hypotheses of the study: --

1. There would be significant effect of continuous, interval and combination of continuous & interval running on percentage of body fat of the school -boys.
2. There would be significant effect of continuous, interval and combination of continuous & interval running on body weight of the school boys.

3. There would be significant effect of continuous, interval and combination of continuous & interval running on explosive leg strength of the school-boys.

4. There would be significant effect of continuous, interval and combination of continuous & interval running on speed of the school-boys.

5. There would be significant effect of continuous, interval and combination of continuous & interval running on agility of the school-boys.

6. There would be significant effect of continuous, interval and combination of continuous & interval running on abdominal strength endurance of the school-boys.

7. There would be significant effect of continuous, interval and combination of continuous & interval running on trunk flexibility of the school-boys.

8. There would be significant effect of continuous, interval and combination of continuous & interval running on resting heart rate of the school-boys.

9. There would be significant effect of continuous, interval and combination of continuous & interval running on respiration rate of the school-boys.
10. There would be significant effect of continuous, interval and combination of continuous & interval running on vital capacity of the school-boys.

11. There would be significant effect of continuous, interval and combination of continuous & interval running on Cardiorespiratory endurance of the school-boys.

LIMITATIONS

1. No special motivational techniques were used during the administering of the study. However, they were encouraged to do their best, although variation is occur in their performance due to lack of the same degree of motivation at the time of pre test and post test is recognized as a limitation of the study.

2. Changes in the climatic conditions during the testing periods could not be controlled.

3. Some other factors such as home environment, daily routines, and diet could not be controlled.

DELIMITATIONS

1. The study was delimited to the 80 male students in the age group of 16 to 19 years.

2. The study was delimited to the students who are studying physical education subject in 11th and 12th standard from Government Senior Secondary School Boys, sector 27, Chandigarh.
3. The study was delimited to 20 subjects in each of the four groups.

4. The study was delimited to following anthropometrical variables: those are body weight and fat.

5. The study was delimited to following physical variables: those are strength, endurance, speed, agility, and flexibility.

6. The study was delimited to following physiological variables: those are resting pulse rate, respiration rate, vital capacity and Cardio-respiratory endurance.

7. The study was delimited to ten weeks of experimental period, which is considered adequate to indicate anthropometrical, physical and physiological changes.

**DEFINITION OF THE TERMS**

**Motor Ability:** - Motor ability is the general athletics ability, it is defined as the present acquired and innate ability to perform motor skills of a general or fundamental nature, exclusive of highly specialised sports or technique (Barrow, 1987).

**Strength:** It is the ability to overcome resistance or to act against. It is in fact a product of voluntary muscle contraction caused by neuromuscular system.

**Explosive Leg Strength:** It is the ability of leg muscles to move body mass in the shortest period of time. Standing broad jump could be used to measure the explosive leg strength for the purpose of the study.
**Speed:** It is the ability to execute motor actions, under given conditions, in minimum possible time (Singh. H, 1984).

**Flexibility:** Flexibility is concerned with the range of movement in joints. It limits the degree to which the body or some part of body can be bent, twisted or moved by means of flexion or extension of muscles (Barrow, 1987).

**Agility:** It is the ability to move the body or parts of the body in space in order to change direction quickly and accurately (Barrow, 1987).

**Endurance:** It is the ability to do sports movements with, the desired quality and speed, under conditions of fatigue (Singh. H, 1991).

**Strength Endurance:** this is the ability to overcome resistance or to act against resistance under condition of fatigue. It can be in the form of static or dynamic strength depending on the nature of the activity.

**Cardio-respiratory Endurance:** It is defined as repeated of sub-maximal load where adjustments of the circulatory, respiratory to the activity are necessary (H.H.Clarke, 1975).

**Resting Pulse Rate:** It has been defined as a number of pulse waves per minute felt at the radial artery early in the morning before leaving bed and an empty stomach.

**Respiration Rate:** The number of breaths a person can take in one minute.
**Vital Capacity:** It is defined as maximal volume of air that can be force fully exhaled from the lungs following maximal inspiration (Shaver, 1981).

**Skin fold measurements:** these are the measurements taken at selected sites of the human body with the help of skin fold calipers to evaluate the status of adipose tissue.

**SIGNIFICANCE OF THE STUDY**

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

2. The finding of the study will provide guidance to physical education teachers and coaches to select the effective conditioning program during various phases in periodization.

3. This study will reveal the comparative effects of basic methods of conditioning after ten weeks. The time requirement for adaptation changes for each conditioning method can be found out.

4. The finding of study will add to the quantum of knowledge in the area of training methods.