Chapter - 1

Introduction
CHAPTER I

INTRODUCTION

People the world over, irrespective of caste, creed, race or religion are conscious of the importance of fitness in day to day life. In any nation, citizens who keep fit are the best asset and weak ones are the liability. Hence, it is the responsibility of every country to give priority to attain the prime factor in developing human resources, viz. physical fitness.

In the United States, reformer's concern about people's, health and fitness during the year 1796 to 1840 led to physical education in schools. Reformers promoted the habit of exercising in gymnasium which for a time became very popular. John C. Warren, Professor of Anatomy and Physiology at Harvard University together with several prominent Bostonians promoted a Gymnasium for Boston residences in 1826. A year earlier Charles Follen, a Harvard instructor had introduced German Gymnastics to Harvard students. In the eastern cities, private Gymnasium opened in the late 1920s. Notable physical fitness experts between 1840 AD and 1885 A.D. are Latherine Bucher, Reverand Henry Ward, Bucher of Brooklyn and Thomas Wantworth Higginson. George Windship, a noted strongman, advocated a system of training with heavy weights through his lectures. Dioclesian Lewis developed a new system emphasising strength, flexibility, agility and grace of movement which was a great success in 1850, 1860 and 1870. It was in early 1940 during the second world war that the term physical fitness became generally used. A mania for fitness all over the world really began in the year 1970 with joggers leading the boom.

The progress of any country depends mainly on the promotion of democratic values and social qualities, and the creation through it of a healthy corporate life which rests on the success of its programmes for raising the standards of physical fitness.
Physical education is regarded an essential part of education at all levels. The University Grants Commission Committee on Physical Education (1967) has rightly pointed out that even in this country, where education has received inadequate attention, no state or educational authority should deny the need for physical education. But in practice sufficiently positive steps are not taken to promote it.

The report further states that funds provided for physical education is inadequate, and even the funds that are available are not properly utilised. As a result, facilities, by and large, are more inadequate in physical education than in other areas.

1.1. FITNESS

Fitness is a state which often characterises the degree to which a person is able to function. Ability to function depends upon the physical, mental, emotional, social and spiritual components of fitness, all of which are related to one another but are mutually independent. This may be referred to as total fitness. While fitness is the maximal, economical and efficient functioning of the body, health is referred to as homeostatic condition of the body.

While fitness is optional and functional according to the activity or the game one undertakes, health becomes a basic necessity to every human being to live best and serve best.

Physical fitness is soundness of body, a condition in which its functions are duly and efficiently discharged. Physical fitness encourages and benefits body mobility, strength etc. To lead a happy and successful life, people have to develop physical fitness because it is necessary for the proper functioning of the body and the system.
The level of fitness varies from person to person and necessity of fitness components is generally not uniform. Fitness is that state which characterises the degree to which a person is able to function efficiently.

1.2. PHYSICAL FITNESS AND HEALTH

When defining physical fitness, it is most apt to describe two types of physical fitness viz., health related and performance related. Both types require exercise and both are linked to proper nutrition, adequate rest, relaxation and good health habits. Without these components, either type of physical fitness is difficult to develop and maintain. The human body is built for movement and vigorous activity, not for rest. It can generate maximum motor responses and psychic stimulations, when it is active. If one does not use it, the person cannot perform his duty economically.

The concept of health related physical fitness was developed during the mid 1970's when physical educators felt that a distinction should be made between functional health and physical performances related ability. They believed that for the majority of the population the emphasis should be on health related fitness, since this may help to prevent certain cardiovascular diseases, obesity and musculoskeletal disorders. In 1980 AAHPER introduced the health related physical fitness test. The test was designed to measure components of physical fitness affecting a positive health state, in particular cardio-respiratory function, fitness of the body and low back musculoskeletal function.

Later the inception of fitness tests (AAHPER, 1956), various test items measuring parameters considered to be skill related rather than health related were deleted from fitness batteries (AAHPER, 1965 and 1976). The deletion of skill related test items can be attributed to the evolution of the definition of physical fitness characteristics associated with good health problems and the prevention of health problems associated with inactivity.
Nehru (1959) in his inaugural address of the first Asian Games at the National Stadium, New Delhi, said that Indians should aim at physical fitness and fitness can only be achieved if one aims high and also organises contests.

The great Greek philosopher Aristotle observed that the body is the temple of the soul and to reach harmony of body, mind and spirit it must be physically fit.

Sports is a thrill for the youth all over the world. It encircles a wide variety of activities during leisure and also as a profession. By the turn of the century health related sport activities will be picking up importance due to appearance of new diseases whose origin is not known. Human body has identical reaction to mental and physical stress and a physically fit person is better able to cope with mental stress.

The movement for maintenance of health by regular physical activity is catching on with people of all age groups becoming aware of the role of body fat in health and fitness and the management of obesity as crucial in health promotion. Health and physical fitness envisage a life to the full. It shows how every one can help himself to vitality as well as longevity. The glorious sensation of feeling well can be achieved by what one eats, the exercises one does and the way one reacts to life. According to Rink Cardiorespiratory endurance is a key factor in health related fitness and is important to many sports performance related activities. For general health and fitness muscular work should consist of well coordinated rhythmical movements which are specially designed more for organic and functional promotion than for mere muscular development of agility and skill.

The integration of social, mental, emotional, spiritual and physical health is called `well - being`. Greenberg opines health consists of five components: social, mental, emotional, spiritual and physical. When these components are in balance, a high level of wellness is achieved. Physical fitness programmes should be so designed as to achieve this balance and to improve each component of health.
To enjoy an optimum state of health and physical fitness, exercises are quite necessary. Exercises are helpful to maintain an organically sound body from birth to death. Health and fitness afford the people an opportunity to live longer and they add to the quality of each day of life. Health and physical fitness are certainly applicable to the old saying made in connection with exercises, 'if you don't use it, you lose it.'

People who keep fit greatly enlarge their fullness of living. Regular stimulation of the total body through vigorous exercises produces increased strength and endurance and characteristics associated with good health. Physical fitness is not an end in itself but a means to an end. It provides a basis for optimal physiological health and capacity to enjoy a full life. It cannot be developed over night. Of course, by sheer hard work it can be achieved over a period. If the important role physical educators can play in improving health is better understood by the public health professionals, support for quality physical education programs will increase.

1.3. PHYSICAL FITNESS AND EXERCISE ON PERFORMANCE

Physical fitness plays a vital role in the performance. An individual's physical fitness and performance depend on the coordinated functioning of the various factors such as physical, physiological abilities, nutrition, technique, tactics, physique, body size and body composition.

Clarke (1987) states that the cardiovascular endurance involves the continued activity of an entire organism during which major adjustment of the circulatory and respiratory systems are necessary as in running, swimming, jumping and the like. This form of endurance depends not only upon the strength of the muscle involved in the activity but relies greatly on the effective functioning of the circulatory system.

Fitness for effective living has many inter dependent components involving intellectual, emotional and physical. Fitness rests upon solid foundation of good
health. Fitness for effective living implies freedom from diseases, enough strength, agility, endurance and skill to meet the demands of daily living and sufficient reserve to withstand stress and strain. Optimum fitness permits a person to enjoy life to the fullest. In addition to the days routine work, one should still have enough vitality to enjoy vocational interest and to meet special challenges that may interrupt the daily routine. The possession of physical strength, agility, flexibility and endurance may enable the individual or group to service, whereas lack of fitness may spell catastrophe. Though hereditary factors play an important role in fitness the development of physical fitness also depends upon his own potential for fitness, his daily living practices, exercise, adequate nutrition, sufficient rest and relaxation etc.

The greatest effect of exercise is the improved organization of the body functions which support activity. This improved physiological efficiency is reflected in increased endurance, strength and agility.

Clarke (1984) has reviewed reports of various studies on the development of muscular strength and power of various methods of loading, i.e. exercises of varying intensity, duration, with or without warmup mental practice etc., and has found that exercises involving various parts of the body with different numbers of repetitions, duration, and tempo had long been the popular and proven method of developing the factors of physical fitness, essential for superior levels of performance in any specific athletic event.

It is well established that warming up is a necessary precondition for any kind of exercise, both to prevent injuries as well as to facilitate efficient movements in performing any motor skill. Warm up reduces blood viscosity, promotes lubrication of joints by secretion of synovial fluids and improves neuromuscular facilitation.
1.4. TOTAL FITNESS

Bucher (1987) stated that modern educators view students as entities and recognize the interrelationship of all their parts. They learn structure and function as a whole. That is why the majority opinion holds that physical fitness should be defined and examined as one aspect of total fitness. Fitness as a total concept has many components, which include intellectual in total fitness leads to more effective and meaningful living. Physical education has a unique interest in that aspect of total fitness, usually called physical fitness, as well as general interest in the other components of total fitness, which can also be influenced favorably through a sound physical fitness, and to enumerate as well as describe its specific factors. The American alliance for health and recreation (1956) arrived at the consensus that fitness is the state which characterises the degree to which a person is able to function efficiently. While fitness is an individual matter, it implies the ability of each person to live most effectively with his potentialities. The ability to function depends upon the physical, mental, emotional, social, moral and spiritual components of fitness, all of which are related to each other and are mutually interdependent.

Total fitness is an ideal state. As no human being is perfect, no one is totally fit. All individuals should strive to reach their potential. They should seek self realization in all their dimensions physical as well as intellectual, social, emotional and spiritual. Each of these strengthens and supports the others. All components of the human organism are reciprocally interrelated and each affects and is affected by the others. A totally fit person would be free from disease and organic impairment. He would have enough endurance and stamina to do a day's work without undue fatigue, participate in wholesome and worthwhile recreation and meet emergencies without inordinate physical or emotional trauma. Total fitness implies the ability of each person to live most effectively with his potential. Ability to function depends upon the physical, mental, emotional, social and spiritual components of fitness, all of which are related to each other and are mutually interdependent.
1.5. MOTOR FITNESS

Barrow and McGee (1982) defined motor fitness as a readiness or preparedness for performance with special regard to big muscles activity without undue fatigue. It concerns the capacity to move body efficiently with force over a considerable length of time.

Motor fitness, as a limited phase of physical fitness, would seem to be the aspect that most fitness tests actually measure. Motor fitness does not assess the factors of physical fitness directly but does reflect them to a certain degree.

1.6. HABITUAL FITNESS

Habitual physical activity will influence fitness, which in turn is correlated with the level of habitual fitness physical activity. There are complex relationships between the level of habitual physical activity, physical and physiological fitness and health. The fittest individual tends to be the most active and, with increasing fitness, people tend to become more active. It is also evident that fitness is related to health in a reciprocal manner. That is, as Shephard (1989) finds health status influences habitual physical activity level also.

FIGURE 1

A SIMPLE PARADIGM OF THE RELATIONSHIP BETWEEN HABITUAL PHYSICAL ACTIVITY, FITNESS AND HEALTH
However, in reality, the relationships between the level of habitual physical activity, fitness and health are more complex than suggested by Figure 1. Other factors are associated with individual differences in health status. Likewise, the levels of physical and physiological fitness are not determined entirely by an individual’s level of habitual physical activity. Other lifestyle components, environmental conditions, personal attributes and genetic characteristics also affect the major factors of the basic model and determine their interrelationships.

FIGURE 2

A MODEL DESCRIBING THE COMPLEX RELATIONSHIPS BETWEEN HABITUAL PHYSICAL ACTIVITY, FITNESS AND HEALTH
1.7. PHYSICAL ACTIVITY

Physical activity can be explained as any bodily movement produced by skeletal muscles and resulting in energy expenditure. Physical pattern is a comprehensive description of physical activity over a defined period of time, concerning the type, frequency, duration and intensity of physical activity. The description of physical activity pattern and the measurement of energy expenditure are the two principal approaches used to quantify physical activity.

1.8. EXERCISE INTENSITY

Exercise intensity can be expressed in either absolute or relative terms. Absolute intensity refers to the actual rate of energy expenditure, and is frequently used to assess physical activity in occupational and epidemiological studies. It is often expressed as a multiple of the resting metabolic rate (MET). Relative intensity refers to the energy cost of the activity expressed as a percentage of the individual's maximum power output, and is customarily used to describe intensity in physiological studies. If allowance is made for the influence of age on maximum power output, the two approaches can be reconciled.

1.9. ENERGY EXPENDITURE

The production of heat energy by the body is expressed in kilojoules. The most important components of overall energy expenditure include basal metabolic rate, physical activity and the thermic effect of food. Basal metabolic rate accounts for the largest portion of daily energy expenditure. Physical activity is clearly the most variable component of total daily energy expenditure.

1.10. FITNESS IN THE PAST

The primitive man had to fight with nature and his surroundings for living while molding himself through the "Survival of the Fittest", Also, he has to be healthy and fit to meet any challenge. From time immemorial, human ability to perform
any physical task was different from man to man. He tried to excel over others in one way or other. Fitness was a natural talent present in olden days for every man as a matter of existence. If he was not fit, he faced dangers of extermination from his environment or wild life. Self defense was the primitive factor, which forced man to be fit. When he lived free from the threats of his life, he needed food for life. He had to earn his food which warranted his fitness. To avoid depending on another human being for his food, he learnt the art of fitness. Thus, historic man right from his evolution - lived fit, out of his necessity, and for existence.

Siddhu (1987) had explained that in the primitive man, nature aroused unlimited curiosity that made him search for truth about nature and about his own status in their nature. When man began his study of the environmental phenomenon to understand what existed around him and with what he was constantly interacting, there developed physical and natural science.

However yoga, an Indian system of exercise which was practiced even before Indus valley civilization, was declared as good for physical fitness and known as India's contribution to world culture in the field of physical education.

It seems that the primitive man moved to the idealistic or philosophic stage where it was believed that the spiritual salvation could be attained only through physical sacrifice. Some sections of people especially the Buddhists started physical sacrifice by avoiding all bodily pleasures.

The magnificent human specimens of ancient Greece were not God's creations, they were the results of systematic physical training. Regular exercise was as much a part of their living as eating and sleeping, because they recognized that harmonious development of all parts of the body was essential to good health.

Socrates, the Greek philosopher envisages a sound mind in a sound body. It is a short but full description of a happy state in this world; he also stated that the two have little more to wish for. The rewards of a rich and full life are closely related to physical capacity of man. Physical strength, muscular power,
Cardio-respiratory endurance, agility and flexibility are still essential in the structure of modern civilization.

The history of mankind is full of evidence that physical fitness has always been an important and essential objective of various civilizations and governments. The English historian Toynbee writes that of the 21 great civilizations of the past, 19 faded away because of the physical and moral decay from within.

Fitness of man has always been a concern of mankind. Physical fitness from prehistoric times to the present day has been equated with survival and power.

Primitive people were fit or they perished. The earliest human beings were dependent mainly upon their individual strength, vigor and vitality for survival. For existence they had to acquire basic skills such as agility, balance, running, endurance and climbing. The primitive physical activity was related closely to survival activity. They had to run in search of food, clothing, shelter and protection from a hostile environment. They had to prepare themselves to fight the animals, enemies and other groups of human beings.

Primitive people participated in both games and dance. The games provided them with fun and also served as a means of preparing youth for adult life. These games were taken from life's activities and became a recognized way to improve strength, speed, skill and similar qualities necessary for survival.

Even though physical fitness in primitive times was necessary for survival, there was little need for organised physical activity in a particular society. It was only when the people settled in one place, the organization of human physical activity became inevitable.

Barrow (1983) stated that many earlier civilization of the world such as Spartan Greeks early Athenian Greeks and early Romans laid great stress upon the physical fitness of their countrymen. Physical training was an important objective of their educational programmes. The countries which developed strong
nationalistic system of education in the 19th and 20th centuries, such as German Nazis, gave great importance to the physical fitness for their countrymen. America during and after world war I and II, had introduced an organized physical training programme for the physical fitness of the youth and this continues even today.

The National policy on education (1968) is a significant step in the history of education. It aims for a radical reconstruction of the education system, to improve its quality at all stages, and gives much greater attention to science and technology, the cultivation of moral values and a closer relation between education and the life of the people.

1.11. FITNESS IN THE PRESENT

Modern age is the age of adventures and mechanical skills. When compared to primitive man, the modern man is poorer and inferior with regard to physical fitness and skills. Man must be dynamic to meet the challenges that are flourishing. Proper use of the body is essentially necessary, if human wish is to grow and develop to its optimum level.

Modern world is the outcome of many scientific inventions. Through centuries scientific instruments and machineries, big and small, have helped us to live our daily life with ease and comfort. The modern man depends mostly upon the modern outfits for his daily routine, involving mainly his mental power to live an easy going life. There has been a fall and deterioration in his physical health and capacities. The modern man need not toil like his forefathers for his daily life. So he has become less vigorous and lethargic.

Man's basic pattern of movements are embodied in the physical fitness and fundamental skills. Most of the games played now-a-days not only give enjoyment but also help to develop physical fitness and skills.

The majority of our people in our country has become physically and psychologically sick. The incidence of disease is very high among the high placed
employees, professionals and more especially among the big bellied executives. The fast paced life of the modern people which is completely unhygienic and against the laws of nature is the major cause of disease.

Eating of unwholesome food, living in unhealthy conditions, doing things at odd hours, evil desires and destructive thoughts, lack of proper exercises and physical fitness are the reasons for diseases in modern time.

Every individual should develop his physical fitness for a happy and effective living. In order to get proper strength and stamina, one has to involve in physical activities.

1.12. FITNESS IN THE FUTURE

Through invention and the advent of the use of robots, man's part in work would be completely brought to nothing. He is to sit in his chair for a longer time and the danger of inactivity is sure to affect him. Before he is crippled due to inactivity, the whole system of physical education throughout the country needs to be revised, redesigned and reintroduced to suit accordingly.

Loperetal and others (1989) emphasized that if physical education is to respond to the social need, a reassessment of the goals and outcomes of the programmes will be the first step. Designing and implementing specific curricular changes to meet new goals come next. Physical educators can and should make every effort to contribute to improved life styles and health in our students and graduates. We should take advantage of our present opportunity for physical education to assume larger leadership role in our schools and society.

Health and fitness invariably provide the people an opportunity to live longer and this add to the quality of every day life. Health and physical fitness are certainly applicable to the old saying in connection with exercises. "If you don't use it you lose it". It is not only necessary for the body but also for the soul.
Exercise can be performed in many ways. Modern men and women feel that their daily work provides them with enough exercise for fitness. Running up and down stairs and standing all day at a job seems to be sufficient physical exertion.

Mackey (1963) states that athletic training and exercise are extremely valuable for general fitness.

Larson and others (1958) stated that components of physical fitness namely resistance, muscular strength and endurance, cardio-vascular respiratory endurance, muscular power, flexibility, speed, agility co-ordination balance and accuracy play a vital role in the development of fitness.

According to Walsh (1968) "physical fitness is the ability to meet each day’s demand without becoming exhausted. It is the ability to take part in the necessary activities with ease and enjoyment, most importantly endurance in life’s emergencies. In short, physical fitness is that condition of your body that gives buoyancy to living.

Life in the coming decades is likely to bring new tensions together with unprecedented opportunities. To enable the people to benefit in the new environment will require new designs of human resource development. The coming generations should have the ability to internalize new ideas constantly and creatively.

1.13. TYPES OF PHYSICAL FITNESS

According to current thinking in the physical education, physical fitness is either health related or performance related. Physical fitness is concerned with the development of those qualities that offer protection against disease.

For example, certain physiological and psychological factors often caused by physical activity are thought to result in degenerative diseases such as obesity and coronary heart diseases. Thus health related physical fitness is important to
everyone and should be stressed by physical educators. Performance in sports and other physical activities requires strength, endurance, agility and speed.

The components of both health related and performance related physical fitness are similar, for example, cardiovascular function, body composition strength and flexibility. However, the degree of development of each component is different for the two types of physical fitness. Compared to health related fitness, more extensive development of these components is required to achieve an appropriate level of performance related fitness. Performance related fitness is often associated with sport. For example, athletes need to develop fitness components of strength to a greater degree, i.e. performance related fitness, than average citizens interested in improving and maintaining their health.

1.14. METHODS OF DEVELOPING PHYSICAL FITNESS

To develop fitness, there are so many training methods adopted in sports and games, that are: circuit training Fertlek training, interval training, pressure training, weight training and resistance training.

Developing and maintaining physical fitness requires vigorous effort by the body as a whole. Strength, muscular endurance, flexibility and cardiorespiratory endurance are the basic components of fitness. These four characteristics are all equated with the healthy functioning of the body.

Hardayal Singh (1984) states that the effect of vigorous training upon certain systems is immediately noticed and felt. In the light of the effect of training it must be apparent that the growth and development of muscular endurance cannot be safely neglected even though they may appear to be non essential.

During vigorous training the blood circulation quickens the blood and lymph stream through the muscles supplying the cell with oxygen and nutrition removing waste products. The heart activity is accelerated exercising and strengthening its own fibres. Exercise also stimulates growth and strengthens the bones, muscular ligaments and tendons.
1.15. PHYSICAL FITNESS COMPONENTS

Clarke (1987) has said that the basic elements of physical fitness are muscular strength, muscular endurance and circulo-respiratory endurance. However the motor fitness components such as speed, agility, flexibility, muscular power and co-ordination fall under the broad term physical fitness.

1.15.1. Speed

Speed has been referred to as the rate at which an individual has the capacity to make successive movements of the same kind.

1.15.2. Agility

Agility is referred to as the controlled ability to change position and direction rapidly and accurately.

1.15.3. Power

Power has been referred to as the capacity of an individual to release maximum force in the shortest period of time.

1.15.4 Muscular Endurance

Borns and Hebbelinche (1974) have defined muscular endurance as the ability of muscular groups to exert repeatedly a submaximal amount of force (dynamic) or to maintain a submaximal contraction over an extended period of time.

1.15.5. Muscular Strength

Muscular strength is referred to as the force exerted by an individual during a single maximal effort.
1.15.6. Muscular Power

Muscular power is referred to as the ability to release maximum muscular force in an explosive manner in the shortest possible time.

1.15.7. Circulatory Respiratory Endurance

Clarke (1987) states that circulatory respiratory endurance is the moderate contraction of large muscle groups for relatively long periods of time.

1.16. NEEDS AND IMPORTANCE OF PHYSICAL FITNESS

For the healthy functioning of the body, physical fitness characteristics that needed are speed, strength, agility, endurance, flexibility and power.

The person who is physically fit has greater strength, energy and stamina and improved sense of well being, better protection from injury because of strong and well developed muscles, safeguarded bones, internal organs and joints that keep moving parts of limbs and improved cardio-respiratory function.

One of the physical fitness components which is dealt with in this study is speed which is the capacity of the individual to perform successive movements of the same pattern at a fast rate.

The other physical fitness component is power which is the capacity of the individual to bring into play maximum muscle contraction at the fastest rate of speed. The third component is strength which is one of the components assigned for the amount of force that can be exerted by a particular muscle. Strength enables an individual to perform his work in an easy manner and excess of it is essential in an emergency.
1.17. SELECTED PHYSIOLOGICAL VARIABLES RELATED TO FITNESS

A number of physiological variables will improve in proportion to physical activity. Some selected physiological variables related to this study are vital capacity, resting heart rate and blood pressure.

Greenberg and Pragman (1986) opine that health consists of 4 components such as mental, emotional, spiritual and physical. When these components are balanced a high level of wellness is achieved. In order to attain the wellness a physical fitness programme should be so designed as to achieve this balance and to improve each component of health.

Another importance of physical fitness is to develop the various organic systems of the body so that they will respond in a healthy way to the increased demands placed on them.

1.17.1. Vital Capacity

Clarke (1978) describes vital capacity as a pulmonary measure often used to represent the capacity of the lungs. It is defined as the largest volume of air that can be exhaled after the deepest possible inhalation. Guyton (1986) states that the major factors affecting the vital capacity are (1) the position of the person during the vital capacity measurement (2) the strength of the respiratory muscles and (3) the dispensability of the lungs and chest cage. Normally vital capacity for men is 4.6 litres and for women it is 3.1 litres. But Sarada and Madavankutty (1987) explain that the average Indian adult man has only 3.9 litres and woman has only 2.6 litres. A tall thin person has a higher vital capacity than an obese person and well developed athletes have a vital capacity thirty to forty percent above normal.

Haward and Payne (1981) say that the vital capacity is an indication of the ability to respond to the additional oxygen requirements of the body during exercise. Daily exercise will definitely improve the vital capacity.
1.17.2. Resting Heart Rate

Resting heart rate is the heart in resting condition. Morehouse and Miller (1971) say that the average heart rate under resting (not basal) is about 78 beats per minute for men and 84 beats per minute for women. Macdougall and others (1991) say that resting heart rate has been popular for a number of years as an index of fitness on the premise that a low resting heart rate indicates the large stroke volume that is usually associated with a large cardiac output and a high aerobic fitness. Fox and Mathews (1981) express the view that training has very pronounced effect on heart rate even at rest. There will be marked difference of resting heart rate for the trained and untrained persons of both sexes. Shaver (1981) observes that there is fear of permanent damage of heart in young children if worked at high heart rates. The latest researches show that this fear is baseless and it is proved that high heart rates only give a parallel growth rate. Sharkey (1984) explains that regular exercise will improve stroke volume and so the heart is able to beat at a slower rate and get rest between beats. The health builder (1959) says that the human heart beats about 1,04,000 times every 24 hours and pumps 60 barrels of blood per day. The American Heart Association suggests that the normal range should be 50 to 100 beats per minute. For an untrained young adult the maximum rate of beat is said to be 170 to 180 and for trained athletes it is 200 to 220, under physical exercise.

Sharkey (1981) says that posture, sex, age and emotion are the basic factors which affect the heart rate. Environmental factors like high temperature and altitude also influence the heart rate.

1.17.3. Blood Pressure

As referred to in the New complete Medical Health Encyclopaedia (1982), the heart is a pump that sends the blood circulating through our body. The pumping action takes place when the left ventricle of the heart contracts. This forces the blood out into the arteries which expand to receive the ongoing blood. But the arteries have a muscular lining that resists this pressure and thus blood is squeezed out into the smaller vessels of the body. Blood pressure is the amount of pressure
of the blood as a result of the heart pumping and the resistance of the arterial walls. The maximum pressure occurs when the left ventricle contracts, it is called the systolic pressure. The minimum pressure occurs just before the heart beats and it is called diastolic pressure. In other words the split-second of maximum work, at the peak of the ventricles contraction is called systolic pressure and the split second of peak relaxation, when the blood from the atria is drained into the ventricles filling it with blood is called the diastolic pressure.

Blood pressure apparatus measures the force with which blood passes through a major artery, such as in the arm, and the pressure varies corresponding to the hearts systolic and diastolic pressure.

Some of the factors affecting blood pressure.

a) Age

It is clear that blood pressure increases with age. Shaver (1981) says that in Western nations 90 / 140 Blood pressure is considered to be normal and in older people 160 to 170 systolic pressure is considered as normal.

b) Sex

Before menopause both the systolic and diastolic pressure are low for females. But it is found that after menopause it becomes a bit higher than in the female.

c) Emotion

The slightest emotional change will fluctuate the blood pressure.

d) Posture

Blood Pressure will vary in different postures.
e) **Resting Respiratory Rate**

Medical dictionary (1951) defines respiration as the act by which the air is drawn in and expelled from the lungs. Guyton (1986) explains that the lungs can be expanded and contracted in two ways. (1) By downward and upward movement of the diaphragm to lengthen or shorten chest cavity and (2) By elevation and depression of the ribs to increase and decrease the antero-posterior diameter thereby providing oxygen for metabolism of the body cells and eliminating the carbon dioxide resulting from oxidation. The exchange of air between the pulmonary alveoli and the environment occurs as a result of rhythmical respiratory movement of the chest. With each inspiration, the volume of the throat and lungs is increased and the pressure within them falls and the air enters the alveoli by the air passages.

The New Complete Medical and Health Encyclopaedia (1982) explains that a normal moderately active person breathes in and out almost 18 times a minute or it is something near 25,000 times a day. The total quantity of air we inhale per day will come around 2,500 gallons. Out of this huge quantity, a very small percentage is used for metabolism. The remaining air is expelled through expiration.

Pearce (1975) says that the respiratory rate is slightly quicker in men than in women. The normal respiratory rate for the new born child is 40, at twelve months it is 30 and 2 to 5 years it is 24 and in adults it is 10 to 20 per minute.

**1.18. NUTRITION AND FITNESS**

Even though there are a number of factors that affect the fitness, nutrition is considered to be one of the major factors among them. Exercise and the optimum intake of nutritious food contributes mainly to physical fitness. The main task of the individual is the balancing of the intake of food and the daily energy expenditure for an ideal weight and fitness.
Shaver (1981) explains that a basic understanding of nutrition and its effects upon health, weight control and physical performance is essential for all people including the coach, trainer and athlete. An athlete's performance may be improved with good nutrition, while at the same time it may deteriorate with poor practices.

There are about forty-five to fifty nutrients in food that are believed to be essential for the body's growth, maintenance and repair. These are classified into six categories like carbohydrates, fats, proteins, vitamins, minerals and water. Carbohydrates and fats are called the energy nutrients since they are used as food fuels during metabolism.

1.19. NORMS

According to Baumgartner and Jackson (1987) norms have many advantage over other standards. First they are unaffected by the performance of the group or the class being evaluated. Another advantage is that the new performance standards need not be developed each year. Once norms are developed, they can usually be used for 2 to 5 years. Moreover, since the same standards are used to evaluate different groups or classes of students, the grades will have a high degree of consistency - a given grade indicating the same degree of ability for each group.

1.20. PURPOSE OF NORMS

The norm taken for the study identifies a person in relation to a given sample whose norm has been determined. Any judgment made about the norm is made by the person using the norm score.

Grade, age, percentile and standard score norms are the four types of norms most commonly used. Grade norms are determined by computing the average of the raw scores for each grade, and using the grade equilateral in place of the average. Age norms are determined by computing the average of raw scores for each age and using the age equivalent in place of the average. Percentile norms are determined by the percentage of individual in the norm group who falls
below an individual score. Standard score norms are represented by the distance of a given raw scores above or below the mean of the norm group as expressed in standard deviation units. Although all types of norms have advantage and disadvantages, the use of standard score or percentile is generally recommended.

1.21. METHODS OF CONSTRUCTING NORMS

Borns and Hebbelinche (1974) states that when norm scales are being constructed one must consider the following practical and educational principles.

1. Sampling Techniques
2. Equivalency
3. Progressivity
4. Sensitiveness

A norm is a standard point of reference that provides a basis for judgment. Norms are used to interpret related standing to compare scores or groups and either to combine of average scores. Norms imply a large number of cases. One hundred cases is minimal and several hundreds is more desirable.

Norms are derived scores that are determined from the raw scores obtained by a specific group on a specific test. A norm should not be taken as a standard against which students are to be judged. Whenever norms are determined for a given group of pupils, half of the pupils will fall above the middle of the distribution and half will fall below. There is no inherent value attached to any given norm score. A norm identifies a person in relation to a given sample whose norm has been determined. Any judgment made about the norm is made by the person using the norm score.

1.22. USES OF NORMS

Norms are developed by transforming raw scores of a given norm group into some type of derived scores so that they may be interpreted more easily. Raw scores can be converted to percentage. Correct scores are those in which
the scores actually obtained on the test are divided by the highest possible test scores. This type of conversion is useful for tests of motor skills and abilities. But cannot be used for comparison among tests.

1.23. CRITERIA FOR SELECTING NORM

There are multivarious reasons why a physical educationist should attempt to construct norms in the existence of numerous tests. As change is the only permanent thing in this universe, the existing test may not give exactly what is necessary at the movement to the physical educator. Hence the attempt to construct norms are very useful in classifying the students in a particular activity according to their ability. Apart from that norms are widely used to diagnose the needs and weakness of the students and to grade the students.

1.24. NORMS AND STANDARDS

Generally in the construction of tests, norms are prepared from testing random samples for whom the tests are intended. Thus norms are based on the status - quo. For skill test, this basis may be satisfactory, especially if the sample includes subjects ranging from poor to superior. For testing of physical fitness, however, this basis is not a facility in as much as the norms will only reflect the present condition of the youth; adequate physical fitness will not necessarily be presented. If a lack of health knowledge is normal, certainly it is not desirable. Thus, standards indicating proper levels of physical fitness components, health knowledge, and other human traits are needed. Unfortunately, such standards do not exist. In this sense, standards differ from norms. A standard is the degree of attainment of a quality or characteristic held to be essential for a certain purpose or function, usually empirically determined and set for specific groups.

Yet norms have a definite value, it will be illustrated. Is a weight of 125 pounds satisfactory? Is a strength index of 1500 good? How can a time of 25.5 seconds on the obstacle race in Scott’s motor ability test for college women be interpreted? What can be expected in athletics from an individual with a score of 190 on McCloy’s general motor ability test? These questions cannot be answered
without additional information concerning the individuals so measured. A weight of 125 will be satisfactory for certain individuals; for others it will indicate a serious underweight condition; and for still others it may mean obesity. With norm charts based upon sex, height, and age, a satisfactory answer can be reached. The same is true of the strength index. Thus a strength index of 1500 may include adequate strength, great strength, of general weakness, depending on the sex, age, and weight of the individual. The obstacle race time of 25.5 seconds becomes meaningful when it is discovered that it has a T-Scale score of 51, representing the average performance on the test for college women. In order to understand the McCloy score of 190, one must know the norm for that individual, the norm in this case being based upon a classification index (age, height and weight).

Norms, therefore are necessary in order to interpret test scores. In physical education, norms may be based on various combinations of age, height and weight as indicated above. In this situation, average scores are usually given with other values to indicate the significance of variance from this point. For example, in the use of age-height-weight tables, usually an individual, 10 percent below the average weight for his age and his height is considered to be underweight, and, if 20 percent above, he is considered obese. In the case of the strength index, the boy or girl whose strength index equals the norm for his or her age and weight has a physical fitness index of 100. This, then, is a median score based on sex, age and weight. A lower score of 85 is at the first quartile according to the norms, and a higher score of 115 is at the third quartile. Thus these variations from average may be interpreted.

Also commonly used in physical education are scoring scales based upon absolute performances, rather than relative performances as above. One such scale is the percentile, which gives the percentage of individuals scoring below points on the scale in the sample upon which the scale was constructed. Thus, 50 percent score below the 50th percentile, 27 percent below the 27th percentile and so on. While easily constructed and readily understood, this scale has the advantage of unequal values for differences in scale points. Actually, the percentile scale is crowded largely around the mean performance; approximately two-thirds of the scale is within the middle one-third of distribution. Moreover, this scale
encourages mediocrity of performance, because it is easy to progress in the middle range of scores, where values are close together, and difficult to improve at the ends of the scale, where values are much farther apart.

Scales based upon standard deviation values of normal distribution have been extensively used in physical education. Four of these are generally recognized: Z-score, T-scale, Sigma - scale and Hull - scale. For the Z-score scale, the mean is zero. The other scores are expressed in terms of plus and minus standard deviation distances from the mean. Thus, a score of -1.5 is 1.5 standard deviation below the mean. For the other three scales, the mean is 50. They differ in the positions from 0 to 100. Zero and 100 in the T-scale are -5 and +5 standard deviations from the mean, for the Sigma and Hull-scale, these distances are 3 and 3.5 standard deviations below and above the mean respectively.

Norm charts themselves must be evaluated to determine their fitness. Several general evaluative factors are discussed briefly below to indicate the nature of this process.

Sampling procedures for the construction of norms should be based upon a wide distribution of the population. In physical education, quite frequently, such samples are definitely limited to rather small geographical areas. Typically, researchers have been restricted to their own general location in the collection of test data. Attempting a broader sampling has its difficulties. Not only is it costly, it would depend upon the utilization of many testers.

The testing sample should be representative of the population for which the test is intended. For example, data for skill test norms collected from athletes would be representative of athletes, but not of the population as a whole. Norms for weight charts based upon boys and girls residing in favored neighborhoods might not properly reflect the status of all classes of children, unless they can be shown to be appropriate for other groups as well.

Norms should be used for specific groups for which they are prepared. As an illustration, the Dyer Tennis test was originally constructed for college women,
and the norms were based upon a sampling of women in a number of colleges. To use these norms therefore, for college men, or for any other group, would be inappropriate.

Norms for standard test should be based on a relatively large number of cases. An arbitrary assignment of a specific number for this purpose is impossible, as viability of the sample depends upon the variability of test data, i.e. the range of scores for the element being tested. The greater the variability of scores, the larger the number required to reduce the standard error of estimate to a negligible quantity. To illustrate, the heights of individuals in a defined population do not vary so greatly as weight or strength for the same population and as a consequence, in the development of norms they will vary within narrower limits. The possibility of securing reliable norms for this trait is much better, therefore, it can be accomplished with a smaller sample of the population.

1.25. HULL SCALE AND ADVANTAGES

Becker says (1960) that the hull scale, which extends to ±3.50, may be considered a compromise between the T-scale and the 6-sigma scale, and the occurrence of an extreme score falling outside the scale is more remote than for the 6-sigma scale. However, an exceptional score can fall outside this scale. In constructing hull scales for Medford boy's growth study data, a check was run on the number of scores that were sufficiently extreme as to extend above 100 points and below point in the distribution. In one study a total of 412 boys of six age groups ranging from 9 to 14 were tested, with eight anthropometric tests. Thus for the eight scales, 3,296 entries were made (412 boys x 8 scales = 3,296) for all scales, only seven entries (.02%) were above 100, and only one entry was below.

1.26. PHYSICAL FITNESS AND COLLEGE STUDENTS

"Physical fitness for what?" must be answered for each individual in terms of his general health, his occupation, vocational activities, his interest, needs and capabilities and many other similar factors. Fitness is very important for everyone besides being a precious commodity which enables human beings to live to the full. Yet, it is really cherished only when it begins to fade away. To an elderly person,
it might be a feeling of youthful vigour, to an athlete, the capacity to run a mile in the minimum possible time, to a stenographer, the ability to type for eight hours at a stretch without developing aching shoulder muscles, to a coach, it is something which comes with training, and to a physician, it is the functional state of the body.

College students need a minimum level of physical fitness. It is here, particularly, that physical education personnel make the most essential and unique contribution. The relationship between health status, health behavior, and physical performance suggests that more attention should be given to an analysis of physical fitness activity. Although physical fitness tests are not designed to measure such health problems as chronic disease or emotional aspects of physical fitness activity and disturbances, they nevertheless normally reflect weakness in these areas. Due to this reason physical fitness tests are valuable as screening devices whereby children and adults who are weak and lack the capacity to perform physically can be detected at an early stage for further thorough examination and for follow up actions. Therefore, a school health programme that fails to test the physical fitness level of children is inadequate.

Physical fitness among male, female students and among people in general exists in varying degrees. Practically anyone can improve his fitness status. Physical activity is essential to achieve physical fitness. There are no short cuts. Physical fitness cannot be stored up. It requires daily attention. The sprinter who fails to run after the track season ends, will backslide in respect of his fitness level.

1.27. REASON FOR SELECTION OF THE TOPIC

The investigator is conscious of physical and mental fitness of college students. As such great stress is being put on developing the fitness of college going students and thereby raising the general standard of fitness of people and the nation as a whole. To measure the physical fitness of the students, a specific method of test is needed.
Even though Kerala State has advanced a lot in the field of sports and games, standard fitness norms exclusively for our students are lacking. As a result, genuine potential talents are generally left unnoticed. A scientific mode of physical fitness testing programme in our colleges may bring forth the real talents within the proper age group which may ultimately bring out remarkable results not only in the field of sports and games but also in other walks of life.

Further, such scientific norms will help sports administrators and promoters to spot the real talents in sports colleges, sports hostels and sports talent schemes, of the governments and other agencies. These norms will help the students of such schemes to assess and improve their physical fitness levels. Testing of physical fitness is a basic requirement in our colleges, so that the fitness of students may be assessed. Unfortunately very few research studies on the subject have been undertaken in India and none at all, so far, in Kerala.

The human body has identical reactions on mental and physical stress. This means that a physically fit person is better able to cope with mental stress. Physical activity provides an outlet that enables a person to 'Let go' or release instinctive aggressive drives. Physical fitness not only plays a vital role for the best performance in sports and games but also in academic excellence and social relationships. Though a number of physical fitness tests are available to assess the physical fitness, the investigator has chosen AAHPERD Health related physical fitness to assess college students, because it is the latest test to assess physical fitness. As Kerala has different types of geographic regions, it is very essential to construct the norms for college students in Kerala with the use of AAHPERD physical fitness test. Hence the investigator has chosen this study for his doctoral research.

1.28. STATEMENT OF THE PROBLEM

The previous practice of testing Indian subjects, using physical fitness norms borrowed from western countries, was found unsuitable due to geographical, climatic and nutritional differences. The Indian subjects, when tested, using the western norms, were seen to score below par. Hence the necessity has arisen to construct our own norms suitable to our conditions.
Therefore, the purpose of the study was to construct the norms for physical fitness test for college men and women students in Kerala State.

1.29. SIGNIFICANCE OF THE STUDY

1. This study may help to assess the level of physical fitness of college men and women students at the time of admission and also help to know the progress of physical fitness during the course of study.

2. This study may help to classify the students into different groups on the basis of their performance.

3. This study may stimulate the students' interest in physical activities through the self-evaluation of this test.

4. This study may provide clear guidelines in selecting potential talents to be groomed for higher levels of competitions.

1.30. DELIMITATION

Two thousand men and women college students were selected as subjects at random from various geographical regions in Kerala. Their age was between 18 and 21 years.

To assess the physical fitness of the college students, AAHPERD health-related physical fitness test was used. This test consists of the following items.

1. Distance run (9 minutes run / walk)
2. Skinfold measurements
3. Modified sit-ups
4. Sit and reach
1.31. LIMITATIONS

The effect of the external factors like climate, atmospheric temperature, height, weight, body structure were considered as limitations of the study.

The possible variations such as air atmospheric pressure and temperature etc during the testing period could not be controlled and their possible influence on the result of the study could not be considered while interpretation of data.

1.32. DEFINITION AND EXPLANATION OF THE TERMS

1.32.1. Norms

Norms are standard points of references that provide a basis for judgment. Margaret (1986) states that norms are derived scores determined from the raw scores obtained by a specific group on a specific test.

1.32.2. Physical Fitness

A person who is physically fit possesses the strength and stamina to carry out his daily tasks without undue fatigue and still has enough to enjoy leisure and to meet unforeseen emergencies.

According to Clarke (1978) physical fitness is the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure time pursuits and to meet unusual situations and unforeseen emergencies.

1.32.3. Health Related Fitness

Tancred (1987) opines that the aspect of physical fitness concerns the development of qualities necessary to function efficiently and maintain a healthy life style. The components of health related fitness are cardio respiratory endurance, muscular strength and endurance, flexibility and body composition.
1.32.4. Hull Scale

Clarke (1978) states that hull scale is made up to 3.5 standard deviation on either side of the mean.

1.32.5. Standard Score

AAHPERD (1980) states that a standard score is a score expressed in terms of standard deviation from the mean.

1.32.6. Cardio - Respiratory Endurance

Margaret (1986) states that cardiovascular efficiency is the ability to perform physical activities for extended periods of time as oxygen is supplied to the various tissues of the body.

1.32.7. Flexibility

Tancred (1987) opines that flexibility is the movement of a joint through the full range of motion.

1.32.8. Muscular Strength

Safrit (1986) states that muscular strength is that maximum force or tension that can be produced by the muscle group.

1.32.9. Body Composition

Tancred (1987) opines that the body composition is the proportion of body fat to lean body tissue.