CHAPTER I

INTRODUCTION

Life will not be life without physical activities. Through physical activities alone people were able to survive in this world. The story of evolution throws some light on the nature and types of activities which are an essential part of modern physical activities which are to be fit for day-to-day existence and to meet the occasional emergencies that arise. Whatever may the emergency that trust itself on individuals the human beings have to readjust and carry on.

Proper growth and maintenance of good health, participation in daily physical activities is an indispensable one. The high level of physical fitness comes from years of daily experience in a selected variety of vigorous physical activities. It is a biological principle that function builds structure and structure decides function. Man needs vigorous exercises for growth and development. To perform the daily activities in a more efficient manner, a condition of muscles, their strength and endurance are essential to man. A muscle must be overloaded in order to be strengthened. (Govindarajulu, 1991)

Every human being participates in some kind of sports activity or physical exercise during the course of his life. This exercise may assume different forms for different individuals. It may be walking, jogging, cycling, working in a factory, participation in games and sports etc. Regular participation in exercise programme markedly influences physical, physiological and mental fitness of an individual.
1.1 BODY COMPOSITION

In physical fitness, body composition is used to describe the percentages of fat, bone and muscle in human bodies. Because muscular tissue takes up less space in our body than fat tissue, our body composition, as well as our weight, determines leanness. Two people at the same height and same body weight may look completely different from each other because they have a different body composition. Body composition (particularly body fat percentage) can be measured in several ways. The most common method is by using a set of measurement calipers to measure the thickness of subcutaneous fat in multiple places on the body. This includes the abdominal area, the subscapular region, arms, buttocks and thighs. These measurements are then used to estimate total body fat with a margin of error of approximately four percentage points. (Voorhees, 2007)

1.2 BODY MASS INDEX

The body mass index (BMI) is a statistical measurement which compares a person's weight and height. Though it does not actually measure the percentage of body fat, it is used to estimate a healthy body weight based on how tall a person is. Due to its ease of measurement and calculation, it is the most widely used diagnostic tool to identify weight problems within a population, usually whether individuals are underweight, overweight or obese. It was invented between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics". Body mass index is defined as the individual's body weight divided by the square of his or her height. The formulae
universally used in medicine produce a unit of measure of kg/m\(^2\). BMI can also be determined using a BMI chart, which displays BMI as a function of weight (horizontal axis) and height (vertical axis) using contour lines for different values of BMI or colours for different BMI categories. (Garabed, 2008)

\[
\text{BMI} = \frac{\text{mass (kg)}}{\text{height}^2 (\text{m}^2)}
\]

BMI provided a simple numeric measure of a person's "fatness" or "thinness", allowing health professionals to discuss over- and under-weight problems more objectively with their patients. However, BMI has become controversial because many people, including physicians, have come to rely on its apparent numerical authority for medical diagnosis, but that was never the BMI's purpose; it is meant to be used as a simple means of classifying sedentary (physically inactive) individuals with an average body composition. For these individuals, the current value settings are as follows: a BMI of 18.5 to 25 may indicate optimal weight; a BMI lower than 18.5 suggests the person is underweight while a number above 25 may indicate the person is overweight; a BMI below 17.5 may indicate the person has anorexia nervosa or a related disorder; a number above 30 suggests the person is obese (over 40, morbidly obese). (WHO, 2002)

1.3 OBESITY

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. It is defined by body mass index
(BMI) and further evaluated in terms of fat distribution via the waist–hip ratio and total cardiovascular risk factors. BMI is closely related to both percentage body fat and total body fat. (Haslam and James 2005)

Obesity in children and adolescents is defined not as an absolute number but in relation to a historical normal group, such that obesity is a BMI greater than the 95th percentile. The reference data that these percentiles are based on are from 1963 to 1994, and thus have not been affected by the recent increases in weight. (Gray and Fujioka K 1991)

<table>
<thead>
<tr>
<th>BMI</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18.5</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5–24.9</td>
<td>Normal weight</td>
</tr>
<tr>
<td>25.0–29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30.0–34.9</td>
<td>class I obesity</td>
</tr>
<tr>
<td>35.0–39.9</td>
<td>class II obesity</td>
</tr>
<tr>
<td>≥ 40.0</td>
<td>class III obesity</td>
</tr>
</tbody>
</table>

While exercising our muscles burn both fat and glucose (carbohydrates in the blood) in different proportions. Depending on how an individual exercises muscle can burn fat in a larger proportion to glucose.

When activity is light and easy we tend to burn a much higher percentage of fat. Fat is a slow burning fuel that requires oxygen so if oxygen is delivered to muscle cells in sufficient quantities the cells can easily burn fat for most of its
energy requirement. A potential problem for weight loss is lighter exercise burns fewer total calories. (Imaz et.al. 2008)

If an individual increases their effort by performing a more intense exercise they will burn more calories however, because oxygen cannot always be delivered to the hard-working cells in sufficient quantities, cells are forced to burn more carbohydrates in order to keep up with increasing demand. If the level of exertion continues to increase then glucose eventually becomes the predominant energy source for muscles as this quick-burning fuel does not require oxygen.

It means to burn fat directly we should exercise at a lower level of effort and for longer duration. However some people just don't have the time to exercise for longer periods. The only way to burn fat quickly is to increase the metabolism through anaerobic exercise so we burn the fat indirectly.(Imaz et.al. 2008)

Obesity leads to Diabetes, Chronic heart diseases, Deterioration of brain functions, Acceleration of aging process and Deteriorated musclo-skeletal system.(Haslam and James, 2005).

All exercise burns calories for they involve movements and energy is required for every movement made. The calorie burning ability of each exercise depends on the speed and/or force at which the exercise is performed. This proves the calorie burning potential of an exercise can be increased depending on an individual's motivation for that movement.
1.4 NEED FOR BURNING OUT FAT

Excessive body weight is associated with various diseases, particularly cardiovascular diseases, diabetes mellitus type 2, obstructive sleep apnea, certain types of cancer, and osteoarthritis. As a result, obesity has been found to reduce life expectancy. (Haslam and James, 2005).

Obesity is one of the leading preventable causes of death worldwide. Large-scale American and European studies have found that mortality risk is lowest at a BMI of 22.5–25 kg/m² in non-smokers and at 24–27 kg/m² in current smokers, with risk increasing along with changes in either direction. A BMI above 32 has been associated with a doubled mortality rate among women over a 16-year period. In the United States obesity is estimated to cause an excess 111,909 to 365,000 death per year, while 1 million (7.7%) of deaths in the European Union are attributed to excess weight. On average, obesity reduces life expectancy by six to seven years: a BMI of 30–35 reduces life expectancy by two to four years, while severe obesity (BMI > 40) reduces life expectancy by 10 years. (Whitlock G, 2009)

1.5 EXERCISE AND ITS CALORIE BURNING POTENTIAL

While exercising our muscles burn both fat and glucose (carbohydrates in the blood) in different proportions. Depending on how an individual exercises muscle can burn fat in a larger proportion to glucose.

It means to burn fat directly we should exercise at a lower level of effort and for longer duration. However some people just don't have the time to
exercise for longer periods. The only way to burn fat quickly is to increase the metabolism through anaerobic exercise so we burn the fat indirectly. Fitness experts taught people worldwide exactly how to use certain exercises to burn fat fast. *(Haslam and James, 2005)*.

All exercise burns calories for they involve movements and energy is required for every movement made. The calorie burning ability of each exercise depends on the speed and/or force at which the exercise is performed. This proves the calorie burning potential of an exercise can be increased depending on an individual's motivation for that movement. To explain this statement a little easier lets look at an example.

Imagine you want to run to get to a shop before it closes. The desire to run fast will be low because the importance is low, after all if you don't make the shop in time you can always go another day. As the importance is lower the calorie count will be far less compared to a sprint needed to escape a dangerous situation. The reason for this is simple, there is now a great desire to run fast in order to survive. An intense effort produced the desired effect - faster leg movements, all down to the motivational level of the individual. If importance is high its easier to increase the calorie count for that exercise providing the individual produces the effort required. *(While exercising our muscles burn both fat and glucose (carbohydrates in the blood) in different proportions. Depending on how an individual exercises muscle can burn fat in a larger proportion to glucose.*
It means to burn fat directly we should exercise at a lower level of effort and for longer duration. However some people just don't have the time to exercise for longer periods. The only way to burn fat quickly is to increase the metabolism through anaerobic exercise so we burn the fat indirectly. Fitness experts taught people worldwide exactly how to use certain exercises to burn fat fast. (Haslam and James, 2005).

- perceived importance of the exercise is low = motivation is low = lower calorie burning

- perceived importance of the exercise is high = high motivation = high calorie burning

Before continuing it should be pointed out at this stage that nobody should suddenly start training like a ferocious animal. Training very hard first requires a gradual build up of fitness levels, also any dieter should not attempt hard exercise in the initial stages of a weight loss program. In the beginning stages exercising should be easier to allow more fat burning rather than purely burning calories. While exercising our muscles burn both fat and glucose (carbohydrates in the blood) in different proportions. Depending on how an individual exercises muscle can burn fat in a larger proportion to glucose.

It means to burn fat directly we should exercise at a lower level of effort and for longer duration. However some people just don't have the time to exercise for longer periods. The only way to burn fat quickly is to increase the metabolism through anaerobic exercise so we burn the fat indirectly. Fitness
experts taught people worldwide exactly how to use certain exercises to burn fat fast. (Haslam and James, 2005).

Anyone can apply the process of burning more calories by simply increasing the effort in each exercise. However to be effective it may require the individual to look at their motivation level.

A few ways to burn more calories when exercising:

- exaggerating each movement in the exercise will help in burning more calories
- exercising the major muscle groups such as legs, back & buttocks can help for burning calories
- exercises such as jogging, walking, dancing require extra energy for balance so can be better for burning calories than cycling or rowing
- burning calories will be increased when movements in an exercise are continuous
- Exercises performed incorrectly will make fat burning a slow process (Schieszer, 2008)

1.6 AEROBIC EXERCISES

The word aerobic meaning with oxygen to represent idea. Even so the dynamics of the idea are more complicated than implied by the definition. Aerobic can be viewed as an intricate system of bodily supply and demand. That is the body needs energy for any kind of activity and the need is filled by burning
off the foods that eat. Oxygen is the spark the fuel needs to burn regardless aerobics is the word in general use. The fact is that Cooper (1969) codified and organized what fitness means to many people. He is generally credited with being one of the main forces of the current fitness craze. The majority medical opinion is that aerobic programs strengthen heart muscle, increase the efficiency of lungs and offer other wonderful benefits.

Aerobic exercise refers to exercise that involves or improves oxygen consumption by the body. Aerobic means "with oxygen", and refers to the use of oxygen in the body's metabolic or energy-generating process. (Concise Oxford English Dictionary)

Many types of exercise are aerobic, and by definition are performed at moderate levels of intensity for extended periods of time. To obtain the best results, an aerobic exercise session involves a warming up period, followed by at least 20 minutes of moderate to intense exercise involving large muscle groups, and a cooling down period at the end.

Both the term and the specific exercise method were developed by Kenneth H. Cooper, M.D., an exercise physiologist, and Col. Pauline Potts, a physical therapist, both in the United States Air Force. Dr. Cooper, an avowed exercise enthusiast, was personally and professionally puzzled about why some people with excellent muscular strength were still prone to poor performance at tasks such as long-distance running, swimming, and bicycling. He began measuring systematic human performance using a bicycle ergometer, and began measuring sustained performance in terms of a person's ability to use oxygen. His
groundbreaking book, Aerobics, was published in 1968, and included scientific exercise programs using running, walking, swimming and bicycling. The book came at a fortuitous historical moment, when increasing weakness and inactivity in the general population was causing a perceived need for increased exercise. It became a bestseller. Cooper's data provided the scientific baseline for almost all modern aerobics programs, most of which are based on oxygen-consumption equivalency. (World Book of Encyclopedia, 1993)

1.7 AEROBIC VERSUS ANAEROBIC EXERCISES

Aerobic exercise and fitness can be contrasted with anaerobic exercise, of which strength training and weight training are the most salient examples. The two types of exercise differ by the duration and intensity of muscular contractions involved, as well as by how energy is generated within the muscle. Initially during aerobic exercise, glycogen is broken down to produce glucose, which is then broken down using oxygen to generate energy. In the absence of these carbohydrates, fat metabolism is initiated instead. The latter is a slow process, and is accompanied by a decline in performance level. This gradual switch to fat as fuel is a major cause of what marathon runners call "hitting the wall". Anaerobic exercise, in contrast, refers to the initial phase of exercise, or to any short burst of intense exertion, in which the glycogen or sugar is consumed without oxygen, and is a far less efficient process. Operating anaerobically, an untrained 400 meter sprinter may "hit the wall" short of the full distance. (Bouchard, et.al. 1999)
Aerobic exercise comprises innumerable forms. In general, it is performed at a moderate level of intensity over a relatively long period of time. For example, running a long distance at a moderate pace is an aerobic exercise, but sprinting is not. Playing singles tennis, with near-continuous motion, is generally considered aerobic activity, while golf or two person team tennis, with brief bursts of activity punctuated by more frequent breaks, may not be predominantly aerobic. Some sports are thus inherently "aerobic", while other aerobic exercises, such as fartlek training or aerobic dance classes, are designed specifically to improve aerobic capacity and fitness. (Kolata, Gina 2002)

1.7.1 BENEFITS OF AEROBIC EXERCISES

The major benefits of aerobic exercises are stronger and more efficiently operating heart and lungs, more energy, physical flexibility, conditioned muscles, proper use of fats and effective burning of calories. The increased oxygen flow gained through aerobics re-energizes by giving any one more energy and a “re-awakening” of his senses. (Kolata, Gina 2002)

In other words, as the heart pumps more blood with fewer beats the body systems are in sync, allowing the subject to take in more oxygen. When everything is operating smoothly, your body can efficiently transport and utilize oxygen with no obstructions the nucleus of this whole system is the heart. Each heart beat is responsible for propelling the oxygenated blood through the proper blood vessels. Aerobic training will produce an increased capacity for pumping larger volumes of blood to accommodate the need for extra energy and extra oxygen. (Kolata, Gina 2002)
Other than running and aerobic dance, aerobic exercises also involves jumping rope, by cycling, swimming, cross country skiing, stationary by cycling, walking etc. An aerobic exercise is any activity that can be sustained for at least 20 minutes at your target heart rate.

Among the recognized benefits of doing regular aerobic exercise are:

- Strengthening the muscles involved in respiration, to facilitate the flow of air in and out of the lungs
- Strengthening and enlarging the heart muscle, to improve its pumping efficiency and reduce the resting heart rate, known as aerobic conditioning
- Toning muscles throughout the body
- Improving circulation efficiency and reducing blood pressure
- Increasing the total number of red blood cells in the body, facilitating transport of oxygen
- Improved mental health, including reducing stress and lowering the incidence of depression (Kolata, Gina 2002)

As a result, aerobic exercise can reduce the risk of death due to cardiovascular problems. In addition, high-impact aerobic activities (such as jogging or jumping rope) can stimulate bone growth, as well as reducing the risk of osteoporosis for both men and women. In addition to the health benefits of aerobic exercise, there are numerous performance benefits:
• Increased storage of energy molecules such as fats and carbohydrates within the muscles, allowing for increased endurance
• Neovascularization of the muscle sarcomeres to increase blood flow through the muscles
• Increasing speed at which aerobic metabolism is activated within muscles, allowing a greater portion of energy for intense exercise to be generated aerobically
• Improving the ability of muscles to use fats during exercise, preserving intramuscular glycogen
• Enhancing the speed at which muscles recover from high intensity exercise (Kolata, Gina 2002)

"Aerobics" is a particular form of aerobic exercise. Aerobics classes generally involve rapid stepping patterns, performed to music with cues provided by an instructor. This type of aerobic activity became quite popular in the United States after the 1970 publication of The New Aerobics by Dr. Kenneth H. Cooper, and went through a brief period of intense popularity in the 1980s, when many celebrities (such as Jane Fonda and Richard Simmons) produced videos or created television shows promoting this type of aerobic exercise. Group exercise aerobics can be divided into two major types: freestyle aerobics and pre-choreographed aerobics (The World Book Encyclopedia, 1993).

For the purposes of this research, the investigator selected two varieties of aerobic exercises, namely, floor aerobic exercises and step aerobic exercises. The descriptions of the floor and step aerobics are detailed below.
1.8 FLOOR AEROBICS

Aerobic exercise refers to exercise that involves or improve oxygen consumption by the body. Aerobic means with oxygen and refers to the use of oxygen in the body’s metabolic or energy generating process. The steps that can be choreographed in to an aerobic dance routine can be varied by impact (i.e., high impact versus low impact.) Aerobic dance exercise (ADE) can usually be completed easily by participants of all ages and fitness level. This is one of the unique characteristics of ADE, in that the same step can be modified by the participants to meet the needs of her individual workout. A typical ADE workout fulfills the cardioresporatory training principles (namely e frequency, intensity, duration, and type of activity continuous) and is similar to any cardio respiratory workout classes begins with a warm up of light activity and stretching exercise for 10 minutes, progress to the 20-30 minutes workout phase and then have a gradual cool down period for 10 minutes. Three parts of a typical 60 minutes program. A number of steps have been defined; walk, run, skip, two-steps, march, jog, jumping jack, step touch, side kicks and touch backs. (Kolata, Gina 2002)

Traditional aerobic dance consists of mixture of running, hopping, skipping, jumping, sliding, and swimming moments and a variety of dance steps self to musics. During performance of these dance routines there is suspension phase of the body during which both feet one momentarily of the floor. This type of a modification of traditional aerobic dance has evolved called “high impact” aerobic dance.
Recently, a modification of traditional aerobic dance has evolved called “low impact” aerobic dance. In this approach, one foot maintained contact with the floor at all times. There by eliminating the suspension phase pf the activity thus the incidence of impact type of influence should be lessened with low impact dance. (Donatelle, Rebecca 2005)

1.8.1 BENEFITS OF FLOOR AEROBICS

Benefits of aerobic exercise include the ability to utilize more oxygen during exercise, a lower heart rate at rest, the reduction of less lactic acid, greater endurance. Also may exercise physiologist have found that it reduces blood pressure and changes blood chemistry. It also improves the efficiency of the heart. More evidence is needed to substantiate the belief by some persons that aerobic exercise is reasonable for the development of supplemental blood vessels to heart which would be held in the event of the heart attack, and also that such exercise results in increasing the size of coronary arteries and thus assisting the flow of blood to the heart if the artery is narrowed by a clot. (Donatelle, Rebecca 2005)

1.9 STEP AEROBICS

Step aerobic was innovated by ‘Gin Miller’, circa 1989. It is a variation of traditional aerobics with the addition of a specially designed platform upon which one can step on and off during the workout, which would be more intense than walking but less intense than running.
The step aerobics was developed by *Gin Miller (1989)* while she was recovering from a knee injury, a trend that took the aerobics industry by storm. This extremely popular style involves stepping up and down from a platform 15 to 30 centimeters (6 to 12 inches) high while performing different step combinations. (*Donatelle, Rebecca 2005*)

Step aerobics exercises produce forces that will stretch, squeeze, bend, twist and vibrate the bones, muscles, joints, tendons and ligaments. Regular exposure to moderately high level of force is actually desirable because mechanical stress will produce structural changes that toughen important anatomical structures. For example, over a period of time the force exerted on the body during moderately vigorous exercise can increase the density of bone so that it resists cracking and breaking. Exercise can also increase the tensile strength of tendons and ligaments so that they are less likely to be stretched or torn.

Researchers reported that the energy cost of step training increased steadily as platform height was increased. The average values of energy cost of stepping at the lower end of the range (4” and 6” platform heights) is approximately equivalent to the values obtained for brisk walking on horizontal ground. As the upper end (10” and 12” platform heights) the range of values reported is similar to those obtained for jogging at speed of 5 to 7 miles per hour. However, the estimates of energy cost at any one platform height vary from group to group. These differences probably reflect differing fitness level of the subjects used in the investigations, and the different choreographic routines used by each of the groups. (*Donatelle, Rebecca 2005*).
The overall energy cost of any routine will depend on the combination of steps that is used by the choreographer. Any routine that has a large proportion of steps that has a large proportion of lunges and traveling alternating lead steps will have greater energy cost than a routine that consists largely of basic steps and lateral steps across the top of the platform. (David, et al. 1996)

To ensure safe and effective aerobic exercise programmes with training, educational organizations emerged to help guide the aerobics industry. The fundamental components of the aerobic exercise programme consists of five segments: the warm – up or pre stretch (10 min) the aerobic segment (20 – 45 min) cool down (5-10 minutes), strength work (10-20 min) and the final stretch (5-10 min). (David, et al. 1996)

1.9.1 BENEFITS OF STEP AEROBICS EXERCISES

Aerobics and step aerobics are more efficient methods to decrease the percentage of body fat to attain the other metabolic benefits of fitness. It is also a very good way to develop musculoskeletal fitness while building strength, flexibility, balance and coordination. Aerobic exercise has positive effects on stamina, blood pressure, weight, sleep patterns, energy levels, lipid profiles, and can reduce the risk of cardio vascular diseases, diabetes and certain type of cancer.

Regular and purposive aerobic exercise improve the hearts pumping efficiency and reduce the resting heart rate by strengthening the heart muscles strengthen the muscles involved in respiration to facilitate the flow of air in and
out of the lungs, tone muscles throughout the body which can improve overall circulation and reduce blood pressure and increase the total number of red blood cells in the body, to facilitate transport of oxygen throughout the body. Regular vigorous aerobic activity can stimulate bone growth, as well as reducing the risk of osteoporosis for both men and women. (Donatella, 2005)

1.10 FITNESS

Fitness is a key to enjoy life. Exercise is an important of a total fitness programme. Modern living has taken all the exercise out of our lives and so in order to get fit and have to put it back again, regular exercise is necessary to develop and maintain an optional level of health, performance and appearance. It makes feel good, both physically and mentally. It gives psychological lift and strengthens a sense of accomplishment. Looking young is a reflection of good health. Regular physical exercise enhance the function of the joints; increase the sense of physical well-being and promotes a sense of feeling good; increases physical working capacity by increasing cardiorespiratory fitness, muscle strength and endurance and decreases the risk of serious diseases that could lead to early disability and death. (Michaud and F. Narring, 1996)

Fitness in the human body what fine tuning is to an engine. It enables us to perform up to our potential. Fitness can be described as a condition that helps us for better look, pleasant feel and do our best. More specifically, it is “the ability to perform daily tasks vigorously and alertly, with energy left over for enjoying leisure time activities and meeting emergency demands. It is the ability to endure, to bear up, to withstand stress, to carry on in circumstances where an
unfit person could not continue, and is a major basis for good health and well being” (Singh, 1991)

Fitness involves the performance of the heart and lungs, and the muscles of the body. And since what we do with our bodies also effects what we can do with our minds, fitness influences to some degree qualities such as mental alertness and emotional stability. (The World Book Encyclopedia, 1993)

1.11 HEALTH RELATED FITNESS

Health - related fitness is important to everyone and should be stressed by physical educators and medical people alike. Health related fitness is defined as the ability to perform strenuous activity without excessive fatigue showing evidence of traits that limit the risks of developing diseases and disorders which affect a person's functional capacity. Components of health related physical fitness are identified as muscular strength, endurance, flexibility, cardiorespiratory endurance and body composition. (Beverly Nichols, 1986)

To enjoy an optimum state of health and physical fitness, exercises are quite necessary. Exercises are helpful in maintaining the sound body through out life. Health and fitness afford the people an opportunity to live longer and they add to the quality of every day life (Greenberg and Pargnam, 1986).

1.11.1 COMPONENTS OF HEALTH RELATED FITNESS

Fitness is defined as “a set of attributes that people have or achieve that relates to the ability to perform physical activity” In other words, it is more than being able to run a long distance or lift a lot of weight at the gym. Being fit is not
defined only by what kinds of activity do how long do it, or at what level of intensity. While these are important measures of fitness, they only address single areas. Overall fitness is made up of five main components, flexibility, muscular endurance, muscular strength, cardiovascular endurance and body composition. (Beverly Nichols, 1986)

1.11.2 FLEXIBILITY

Flexibility is the range of motion around a joint. Good flexibility in the joints can help prevent injuries through all stages of life. (Uppal, 2004)

Flexibility is a pre requisite for maximal development of movement force and speed. Greater range of movement enables the muscles to develop more force and speed and also allows movements with minimum of muscle tension and internal resistance help in achieving higher movement economy (Singh, 1991)

Flexibility is significant in performing sports skills and also in physical medicine such as rehabilitation, general health and fitness, example, flexibility exercises for relief of dysmenorrhea, general neuromuscular tensions and low back pains (Baechle, 1994). Inadequate flexibility leads to errors in movement execution. Because of its effect on technique it assumes importance for tactical skills. Optimum level elasticity, stretchability and suppleness of muscles and ligaments help in absorbing the shocks and external forces tending to cause an injury. (Singh, 1991)

1.11.3 MUSCULAR ENDURANCE

Muscular endurance is the ability of the muscle to continue to perform without fatigue. (Hardayal Singh, 1991).
The working capacity of complete psycho-physical apparatus of an individual depends relatively on muscular endurance capacity. It ensures high quality skill of movement execution which finds expression in accuracy, precision, rhythm and consistency. Endurance training results in the improvement of functioning of various organs and energy systems of the human body. This, in turn improves the ability to recover quickly, from training competition load and at the same time it resist fatigue. It is of high value, for maintenance of good organic health, for increasing the general resistance against infection and for cure and treatment of various diseases and metabolic disorders (Singh 1991).

1.11.4 MUSCULAR STRENGTH

Muscular strength is the ability of the muscle to exert force during an activity. The key to making your muscles stronger is working them against resistance, whether that is from weights or gravity. (Hardyal Singh, 1991)

Strength is highly related to muscle hypertrophy. The process of hypertrophy increases in the synthesis of the contractile protein, action and myosin with in the myofibrils within a muscle fiber. Increase in the size of muscle fibers increases the over all bulk of muscle. Thus, muscular strength depends largely on the energy liberation process in the muscles and it is a direct product of muscle contractions caused by the intensity of neuro-muscular excitation. In sports movements strength is utilized in combination with endurance and speed abilities (Singh, 1991)
1.11.5 CARDIORESPIRATORY ENDURANCE

Cardio respiratory endurance is the ability of the body’s circulatory and respiratory systems to supply fuel during sustained physical activity. (Shamal Kaloy, 2007)

The functional capacity of the cardio respiratory system, heart, lungs and blood vessels are described through aerobic capacity of an individual. It is a function both of cardiorespiratory performance and the maximum ability to remove and utilize oxygen from circulating blood. To measure cardio respiratory capacity a subject will undergo progressively more strenuous exercise from an easy walk through to exhaustion. The higher the measured cardiorespiratory endurance level, the more oxygen has been transported to and used by exercising muscles, and the higher the level of intensity at which the individual can exercise. More simply stated, the higher the aerobic capacity, the higher the level of aerobic fitness. The Cooper test can be used to assess functional cardiorespiratory endurance. (Shamal Kaloy, 2007)

1.11.6 BODY COMPOSITION

Body composition refers to the relative amount of muscle, fat, bone and other vital parts of the body. A person’s total body weight may not change over time. But the bathroom scale does not assess how much of that body weight is fat and how much is lean mass, body composition is important to consider for health and managing. (Barrow and Mcgee, 1982)
For the purpose of this research, to find out the influence of varied exercises, namely floor aerobics and step aerobics on selected fitness variables, the investigator selected the above five components.

1.12 PHYSIOLOGY

The term physiology was derived from a Greek word ‘Physiologikos’ meaning discourse on natural knowledge, physiology deals with the normal functioning of human body (Shamal Kaloy, 2007)

Exercise physiology is the scientific study of physiological changes in athletes body with the effects of exercise, whether long term or short term. Different environmental changes, namely, altitude, climate, temperature, humidity, nutritional status etc have some close associations with the optimal performance of an athlete. (Shamal Kaloy, 2007)

For the physiological systems of the body to be fit, they must function well enough to support the scientific activity that the individual is performing moreover different activity make different demands upon the organism with respect to the circulatory, respiratory metabolic and neurologic processes which are specific to the activity. (Bangsbo, J. 1996).

1.12.1 IMPORTANCE OF PHYSIOLOGY

High level of performance in sports and games might be dependent upon the physiological make up and it was recognized that physiological proficiency was needed for the high level performance. (Gianetti, G et.al. 2008)
For specific physiological systems of the body to be fit, they must function well enough to support the particular game that the player is playing. Since different games make different demands up on the organism with respect of neurological, respiratory, circulatory and temperature regulating functions physiological fitness is specific to the activity. Physiological systems are highly adaptable to exercise. (Gianetti, G et.al. 2008)

In order to find out the influence of varied aerobic exercises on physiological variables, the researcher selected variables, vital capacity, resting heart rate, mean arterial blood pressure, breath holding time and respiratory rate.

1.12.2 VITAL CAPACITY

Vital capacity is the maximum amount of air a person can expel from the lungs after a maximum inspiration. It is equal to the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume.

A person's vital capacity can be measured by a spirometer which can be a wet (LMAO) or regular spirometer. In combination with other physiological measurements, the vital capacity can help make a diagnosis of underlying lung disease. The unit that is used to determine this vital capacity is milliliters (http://en.wikipedia.org/wiki/Vital_capacity)

1.12.3 RESTING HEART RATE

Resting heart rate which is the number of beats felt exactly one minute. The average rate of the pulse in a healthy adult is 72 beats in each minute. There
may be variation of up to five beats per minute within the normal range. The number of beats of a pulse per minute or the number of beats of the heart.

The resting heart rate varies greatly among different people and in the same person under different situations. The American Heart Rate Association accepts as normal range from 50 to 100 beats per minute. The average rate is 72 beats per minute but the rate can accelerate to 220 per minute. The lesser heart rate given good performance for all the sports and games. (P.J.Strukic, 1981)

1.12.4 MEAN ARTERIAL BLOOD PRESSURE

The mean arterial blood pressure is a term used to describe an average blood pressure in an individual. It is defined as the average arterial pressure during a single cardiac cycle. (Zheng L, Sun Z, Li J, et al. 2008).

Mean arterial blood pressure is considered to be the perfusion pressure seen by organs in the body. It is believed that a mean arterial blood pressure that is greater than 60 mmHg is enough to sustain the organs of the average person. If the mean arterial blood pressure falls significantly below this number for an appreciable time, the end organ will not get enough blood flow, and will become ischemic.

At high heart rates mean arterial blood pressure is more closely approximated by the arithmetic mean of systolic and diastolic pressures because of the change in shape of the arterial pressure pulse.
1.12.5 BREATH HOLDING TIME

Breath holding time is defined as the duration of time through which one can hold his / her breath without inhaling and exhaling after a deep inhalation.

There are two types of breath hold time:

- Positive Breath holding time
- Negative Breath holding time

Endurance type of training will improve the breath holding time. Breath holding time also plays a vital role in the sports performance. *(P.J.Strukic, 1981)*

1.12.6 RESPIRATORY RATE

Respiratory rate which is number of breath inspired and expired in one minute. It indicates our lungs capacity. The lesser respiratory rate given good performance for all the games and sports. Regular participation in endurance activity such as jogging, cycling and distance swimming can be done to reduce the respiratory rate.

1.13 BIOCHEMICAL VARIABLES

Biochemistry is the study of the chemical processes in living organisms. It deals with the structure and function of cellular components such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules. *(www.freeonlinedictionary.com)*

Exercises produces biochemical changes in the cardiorespiratory system and other important alterations in body composition such as proteins, carbohydrates, lipids and triglyceride levels *(Scharhag,et.al. 2008)*
The investigator to find out the influence of varied aerobic exercises on biochemical variables, selected variables, high density lipoprotein, low density lipoprotein, total cholesterol and triglyceride for this study.

1.13.1 LIPIDS

Mobilisation of free fatty acids is important during aerobic exercise. As a consequence of anaerobic exercise, considerable mobilization of free fatty acids occurs resulting in body fat loss. The exercise can beneficially alter blood lipid values and this is related to volume and intensity of training (Pollock and Wilmore, 1990).

The exercises reduces blood cholesterol and low density lipoprotein along with increased high density lipoprotein. These changes work together to reduce the risk of heart attacks and brain strokes (Grana and Kalenak, 1991).

1.13.2 HIGH DENSITY LIPOPROTEIN (HDL)

The HDL contain the least amount of cholesterol HDL’s may operate to protect against heart diseases in two ways:

1. To carry cholesterol away from the arterial wall for degradation to bile in the lives and subsequently excreted by the intestines.

2. To compete with the LDL fragment for entrance into the cells of the arterial wall.

A high level of HDL is associated with a lower heart disease risk, even among individuals with total cholesterol below 200 mg dl\(^{-1}\). It is encouraging
from an exercise perspective that HDL levels are elevated in endurance athletes and may be favourably altered in sedentary people who engage in either vigorous aerobic training or more moderate levels of regular exercise.

1.13.3 LOW DENSITY LIPOPROTEIN (LDL)

LDL contain the greatest fat and least protein components. The LDL’s normally carry 60 to 80% of the total cholesterol and have the greatest affinity for the artery wall. They help to carry cholesterol into the arterial tissue to become chemically modified and ultimately cause proliferation of underlying smooth muscle cells and further changes that damage and narrow the artery in the process of coronary heart disease.

LDL are means for transporting fat throughout the body for delivery to the cells, including those of the smooth muscle walls of the arteries. LDL is targeted for peripheral tissue and is associated with arterial damage. Elevated levels of LDL represent an increased risk.

1.13.4 BLOOD CHOLESTEROL

Cholesterol, a sterol, is the most familiar of all the derived lipids. Cholesterol synthesized from acetate in all animal tissues, is a precursor of cholic acid, vitamin D and the steroid hormones, including estradiol, progesterone, testosterone, and adrenal steroids. A high level of serum cholesterol and the cholesterol rich low density lipoprotein molecule are associated with an increased risk of coronary artery disease. Cholesterol deposits on the inner lining of the medium and larger arteries results in anthroposclerosis (McArdle et al. 1991).
1.13.5 TRIGLYCERIDE

Triglyceride is a glyceride in which the glycerol is esterified with three fatty acids. It is the main constituent of vegetable oil and animal fats. Triglycerides are formed from a single molecule of glycerol, combined with three fatty acids on each of the OH groups, and make up most of fats digested by humans. Ester bonds form between each fatty acid and the glycerol molecule. This is where the enzyme pancreatic lipase acts, hydrolysing the bond and "releasing" the fatty acid. In triglyceride form, lipids cannot be absorbed by the duodenum. Fatty acids, monoglycerides (one glycerol, one fatty acid) and some diglycerides are absorbed by the duodenum, once the triglycerides have been broken down. Increased exercise and reduced carbohydrate consumption ameliorate one potential cause of insulin overproduction to help maintain sensible triglyceride levels. (http://en.wikipedia.org/wiki/Triglyceride)

1.14 PSYCHOLOGICAL VARIABLES

The application of psychological principles to the improvement of performance in sports has received greater attention in these days. There are certain accepted psychological principles which have to be applied, so that the athletes and players are able to show their best in their performances. Coaches, physical educationists and sports scientists have always expressed a great need to know more about those psychological principles, which are helpful in improving the motor skills of the players. It is important to know about the role of reaction time, movement time, emotional phenomena like competitive anxiety and some
personality traits like extroversion and neuroticism of the players during training as well as competitive situations (Ajmeer Singh, 2005).

One of the most significant contributions of sports psychology in recent years is the attempt by many sports psychology educators, researchers and clinicians to more clearly define, explain and refine psychology as involved in sport and exercise settings.

The vagueness of the field is being replaced by a more solid structure and the ability to communicate more intelligently about its role and function. Research efforts from all parts of the world are helping to create scientific foundations for sports psychology. In this research to find out the influence of varied aerobic exercises on psychological variables, the investigator selected self confidence, emotional adjustment, assertiveness, interpersonal relationship and stress management as measured through Personality Development Index of (Kaliappan, 1993).

1.14.1 SELF CONFIDENCE

Self-confidence is an attitude which allows individuals to have positive yet realistic views of themselves and their situations. Self-confident people trust their own abilities, have a general sense of control in their lives, and believe that, within reason, they will be able to do what they wish, plan, and expect. People who are not self-confident tend to depend excessively on the approval of others in order to feel good about themselves. As a result, they tend to avoid taking risks because they fear failure. They generally do not expect to be successful. (http://psychology.wikia.com/wiki/)
1.14.2 EMOTIONAL ADJUSTMENT

Emotional adjustment (also referred to as personal adjustment or psychological adjustment) is the maintenance of emotional equilibrium in the face of internal and external stressors. This is facilitated by cognitive processes of acceptance and adaptation. An example would be maintaining emotional control and coping behavior in the face of an identity crisis. This capacity is an important aspect of mental health and where it is compromised, or not developed, psychopathology and mental disorder can result. (http://psychology.wikia.com/wiki/)

1.14.3 ASSERTIVENESS

Assertiveness is a trait taught by many personal development experts and psychotherapists and the subject of many popular self-help books. It is linked to self-esteem and considered an important communication skill. As a communication style and strategy, assertiveness is distinguished from aggression and passivity. How people deal with personal boundaries; their own and those of other people, helps to distinguish between these three concepts. Passive communicators do not defend their own personal boundaries and thus allow aggressive people to harm or otherwise unduly influence them. They are also typically not likely to risk trying to influence anyone else. Aggressive people do not respect the personal boundaries of others and thus are liable to harm others while trying to influence them. A person communicates assertively by not being afraid to speak his or her mind or trying to influence others, but doing so in a way that respects the personal boundaries of others. They are also willing to defend themselves against aggressive incursions. (http://psychology.wikia.com/wiki/Assertiveness).
1.14.4 INTERPERSONAL RELATIONSHIP

Interpersonal relationships are social associations, connections, or affiliations between two or more people. They vary in differing levels of intimacy and sharing, implying the discovery or establishment of common ground, and may be centered around something(s) shared in common. The study of relationships is of concern to sociology, psychology and anthropology. (http://psychology.wikia.com/wiki/).

1.14.5 STRESS MANAGEMENT

Stress management is the amelioration of stress, especially chronic stress. Stress is caused by distinct, measureable life events, and further, that these life stressors can be ranked by the median degree of stress they produce (leading to the Holmes and Rahe Stress Scale). Thus, stress was traditionally conceptualized to be a result of external insults beyond the control of those experiencing the stress.

1.15 NEED OF THE STUDY

Technical Education and Vocational Education and training are the two most critical components of Human Resource Development. The contribution in raising the quality of life is immeasurable. One of the keys to a productive and competitive economy in the new millennium is a well trained and acceptable work force. For labour markets to minimize unemployment, workers need to be able obtain and transfer jobs with updated and enhanced skills. To create adequate skilled technical professionals a number of engineering colleges have
been established in Tamil Nadu. Tamil Nadu is the state which produces maximum Engineers in our country. The total number of Engineering Colleges in Tamil Nadu is 420 for the academic year 2009-2010. The annual intake of engineering students stands around 1,30,000 and more than 5 lakh engineering students are pursuing their technical education at any point of time.

Except few University attached departments, Government and Government Aided Engineering Colleges, which forms about 2% of the total engineering colleges, all the other colleges are situated outside the city / town limits and the students are transported by the respective colleges or the students make their own arrangements to reach the college. Thus, the engineering students are compelled reach their transport point by early 6.30 or 7.00 am. Morning and reaching back to their home by 7 PM in the night. Thus, their life style made them to deprive off their morning and evening physical activity time and normally spend more than 4 hours daily in the Bus / Van to reach the college and back to home. This resulted in minimal physical activity or no physical activity and there was no possibility of burning the excess fat accumulated in the body. Because of these life patterns, an approximate estimation revealed that more than 50% of the engineering students enrolled in first year became overweight or obese in the next year and about 70% of the students became overweight or obese at the time of their completion of the Degree course.

Obesity increases the risk of many physical and mental conditions. These comorbidities are most commonly shown in metabolic syndrome, a combination of medical disorders which includes: diabetes mellitus type 2, high blood
pressure, high blood cholesterol, and high triglyceride levels. Complications are either directly caused by obesity or indirectly related through mechanisms sharing a common cause such as a poor diet or a sedentary lifestyle. The strength of the link between obesity and specific conditions varies. One of the strongest is the link with type 2 diabetes. Excess body fat underlies 64% of cases of diabetes in men and 77% of cases in women.

Can the Government, Parents, Students, Educational Authorities and philanthropists who put enormous efforts, time, labour, management, finance and place allow to hinder the functioning of the trained skilled force produced because of the obesity of the engineering graduates? The investigator as a Director of Physical Education programmes in an Engineering College ventured to give an awareness on the obese level among engineering colleges, and the fitness, physiological and biochemical status of engineering colleges and the effect of floor aerobics and step aerobics on the selected variables. Hence, this research to find out the effect of two different aerobic exercises, namely floor exercises and step aerobics exercises, on the selected fitness, physiological and biochemical variables was undertaken. The exercises selected require more or less no equipment and can be performed daily by any individual within limited space and with minimum time.

1.16 REASONS FOR SELECTION OF TOPIC

Physical exercises do give us enormous benefits for the whole some physical and health fitness of a man. All exercise burns calories for they involve movements and energy is required for every movement made. The calorie
burning ability of each exercise depends on the speed and/or force at which the exercise is performed. Aerobic exercise refers to exercise that involves or improves oxygen consumption by the body. That is the body needs energy for any kind of activity and the need is filled by burning off the foods that eat. Oxygen is the spark the fuel needs to burn regardless aerobics is the word in general use. The major benefits of aerobic exercises are stronger and more efficiently operating heart and lungs, more energy, physical flexibility, conditioned muscles, proper use of fats and effective burning of calories. The increased oxygen flow gained through aerobics re-energies by giving any one more energy and a “re-awakening” of his senses. The benefits of aerobic exercises to obese men include reduction of their fat which resulted in their improvement in the fitness, physiological, biochemical and psychological status.

In this study, the researcher was interested to find out the influence of varied aerobic exercises, namely, floor aerobics and step aerobic exercises on selected fitness, physiological, biochemical and psychological variables of obese students of engineering colleges.

1.17 REASONS FOR SELECTION OF VARIABLES

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy. The primary treatment for obesity is dieting and physical exercise. Comparing with a normal healthy adult, an obese adult have lesser cardiovascular endurance, muscular flexibility, muscular strength, muscular endurance and increased body composition. Researches proved that exercises burn out fat,
increased the cardiovascular endurance, flexibility, strength, endurance and
decrease the body composition. There is lack of researches to which extent floor
aerobics and step aerobics influences the selected fitness variables. Hence, the
investigator selected the above fitness variables for this research.

The increased physical activities in the forms of floor aerobics and step
aerobics influences, the physiological variables, vital capacity, resting heart rate,
blood pressure, breath holding time and respiratory rate of the obese adults,
therefore, the investigator selected these physiological variables in this study.

The impact of the floor aerobic exercises and step aerobic exercises which
influences the selected fitness and physiological variables is bound to affect the
biochemical variables of the obese adults. Total cholesterol, low density
lipoprotein, high density lipoprotein and triglycerides are affected due to
exercises and the researcher selected these variables to find out the influence of
varied aerobic exercises on obese adults.

There are number of researches to prove that obese men and women lack
adequate psychological requirements to face the life confidently. The researches
perceived that the influence of varied aerobic exercises would affect the
psychological variables self confidence, emotional adjustment, assertiveness,
inter personal relationship and stress management. Hence, these variables were
selected for this research.

1.18 STATEMENT OF THE PROBLEM

The purpose of this study was to find out the influence of varied aerobic
exercises, on selected fitness, physiological, biochemical and psychological
variables of obese men engineering college students.
1.19 HYPOTHESES

The following hypothesis were formulated to be tested and accepted or discarded on the basis of crucial observation and experiments.

1. It was hypothesized that the step aerobics training would have significantly greater influence on the selected fitness variables, namely, cardiovascular endurance, muscular flexibility, muscular strength, muscular endurance and body mass index than the floor aerobics among obese students of engineering colleges.

2. It was hypothesized that the step aerobics training would have significantly greater influence on the selected physiological variables, namely, vital capacity, mean arterial blood pressure, resting pulse rate, respiratory rate, breath holding time than the floor aerobics among obese students of engineering colleges.

3. It was hypothesized that the step aerobics training would have significantly greater influence on the selected biochemical variables, namely, high density lipoprotein, low density lipoprotein, total cholesterol, triglycerides than the floor aerobics among obese students of engineering colleges.

4. It was hypothesized that the step aerobics training would have significantly greater influence on the selected psychological variables, namely, self confidence, emotional adjustment, assertiveness, interpersonal relationship, stress management than the floor aerobics among obese students of engineering colleges.
1.20 SIGNIFICANCE OF THE STUDY

This study was significant in the following ways:

1. The study will be significant in determining different training schedules for obese men.

2. The study will be significant in assessing the fitness, physiological, biochemical and psychological levels of college obese men.

3. The study will be significant in finding out the influence of varied aerobic exercises on selected fitness, physiological, biochemical and psychological variables among college obese men.

4. This study would be beneficial to physical education teachers and fitness trainers to prescribe suitable aerobic exercises for reducing obesity.

5. The findings of this study would be helpful to the obese adults in improving their fitness, physiological, biochemical and psychological fitness.

6. The findings of this study would be helpful for future researchers to undertake similar studies at different levels.

1.21 DELIMITATIONS

The following delimitations were recorded for this study.

1. Sixty obese men studying in different engineering colleges in Chennai were selected for this study.
2. Obesity of the subjects was determined based on the body mass index of the subjects. The subjects who were having more than 35% were considered as obese for the purpose of this study.

3. The subjects selected for this study were in the age group of 20 – 25 years.

4. The subjects were divided into three groups. Each group consisting of twenty each, namely, experimental group I, experimental group II and control group.

5. Only two different aerobic exercises, namely, floor aerobics and step aerobic exercises were selected for this study.

6. Only the following health related fitness variables as fitness variables were selected for this study:

   **Fitness Variables**
   
   a. Cardiovascular Endurance
   
   b. Muscular Strength
   
   c. Muscular Endurance
   
   d. Flexibility
   
   e. Body Composition

7. Only the following physiological variables were selected for the study

   **Physiological variables**

   a. Vital Capacity
   
   b. Mean Arterial Blood Pressure
c. Resting Pulse Rate
d. Respiratory Rate
e. Breath Holding Time

8. Only the following biochemical variables were selected for this study.

**Biochemical variables**

a. High Density Lipoprotein
b. Low Density Lipoprotein
c. Total Cholesterol
d. Triglycerides

9. Only the following psychological variables were selected for this study

**Psychological Variables**

a. Self confidence
b. Emotional adjustment
c. Assertiveness
d. Inter personal relationship
e. Stress management.

**1.22 LIMITATIONS**

The study was limited in the following ways, which would be taken into consideration at the time of findings of this study.

1. The investigator has not taken into consideration of the past experiences of the subjects in exercising.

2. The climatic conditions, diet and other daily routines of the subjects were not controlled.
3. The economical and social background of the obese students was not taken into consideration.

1.23 DEFINITION OF TERMS USED

The following terms used in this study were defined.

1.23.1 Training

In the words of Singh (1991) "training is a pedagogical process which makes possible the achievement of high standard performances without any physical or mental damage, through the planned systematic development of certain specific skills, physical capabilities and the adaptation of the organism".

Training is defined as "a systematic process of repetitive, progressive exercise or work, involving the learning process and acclimation" (Cooper, 1970).

1.23.2 Aerobic Exercise

Aerobics means ‘with oxygen’. Aerobic exercise is designed to produce a sustained increase in heart rate and whose energy cost can be met by the body from aerobic sources, that is, from increased oxygen consumption. – (Cooper, 1970)

1.23.3 Health Related Fitness

Physical activity, which can have definite influences on the health and the well being of children and adolescents, as well as adults, is defined as health related fitness. (Michaud and Narring, 1996)
1.23.4 Fitness

Fitness is the utilization of excessive calories by a cardiovascular and muscular process bringing the body to optimum efficiency. (Kennedy 1988)

1.23.5 Cardiorespiratory Endurance

Cardio respiratory endurance is the ability of the body’s circulatory and respiratory systems to supply fuel during sustained physical activity. (Astrand, 1977)

1.23.6 Muscular Strength

Muscular strength is the ability of the muscle to exert force during an activity. The key to making your muscles stronger is working them against resistance, whether that is from weights or gravity. (Mathews, 1981)

1.23.7 Muscular Endurance

Muscular endurance is the ability of the muscle to continue to perform without fatigue. (Mathews, 1981)

1.23.8 Body Composition

Body composition refers to the relative amount of muscle, fat, bone and other vital parts of the body. A person’s total body weight may not change over time. But the bathroom scale does not assess how much of that body weight is fat and how much is lean mass, body composition is important to consider for health and managing (Johnson and Nelson 1988).
1.23.9 Flexibility

Flexibility is the range of motion around a joint. Good flexibility in the joints can help prevent injuries through all stages of life (Johnson and Nelson 1988).

1.23.10 Physiology

Physiology is the study about the function of the body. (Astrand, 1977)

1.23.11 Resting Pulse Rate

The time from the end of one contraction to the end of the next contraction is a complete heart beat or pulse or cardiac cycle. The complete cardiac cycle takes less than one second (about 0.08 sec) in a normal adult at rest and it shortened by exercise. (Astrand, 1977).

1.23.12 Mean Arterial Pressure

It is defined as the average arterial pressure during a single cardiac cycle.

As blood is pumped out of the left ventricle into the arteries, pressure is generated. The mean arterial pressure (MAP) is determined by the cardiac output, systematic vascular resistance and central venous pressure according to the following relationship, which is based upon the relationship between flow, pressure and resistance. (Edward and Mathews, 1981)
1.23.13 Vital Capacity:

The volume of air that can be moved out of the lungs after maximum inspiration is called vital capacity. (Morehouse and Miller, 1967)

1.23.14 Respiratory Rate

Number of breath inspired and expired in one minute (Morehouse and Miller, 1967).

1.23.15 Breath Holding Time

Breath holding time is defined as the duration of time through which one can hold his breath without the study of all living things. (Laurence E. Morehouse and Augustus T. Miller, 1967).

1.23.16 High Density Lipoprotein (HDL)

HDL, a type of protein molecule carried in the blood that removes cholesterol from tissues and appears to protect against coronary heart disease. Reduces the development of atheroma and atherosclerosis. HDL was estimated by phototungstate method and is expressed as mg/dl. (Mc Ardle and Katch, 1991)

1.23.17 Low Density Lipoprotein Cholesterol (LDL)

Low Density Lipoprotein Cholesterol is the major cholesterol carrying lipoprotein. Elevated LDL levels herald a strong predisposition to coronary heart disease, stroke and peripheral vascular disease. LDL was calculated using Priedwalad’s equation and expressed as mg/dl. (Mc Ardle and Katch, 1991)
1.23.18 Triglycerides (TG)

Triglycerides are composed of the three carbon molecule glycerol and three fatty acids, one attached to each of the glycerol carbons. Triglycerides make up 95% of the fats found in foods. TG were estimated by enzymatic calorimetric method and expressed as mg/dl. (Mc Ardle and Katch, 1991)

1.23.19 Cholesterol (TC)

Cholesterol is the fatty substance formed in the blood. Cholesterol is a white fatty alcohol of steroid group, found in body tissue, blood and bile, assists in synthesis of vitamin D and various hormones. Excessive deposits of cholesterol inside arteries are associated with arteriosclerons and coronary heart disease. TC was estimated using erymatic calorismetric method and expressed as mg/dl. (Mc Ardle and Katch, 1991)

1.23.20 Psychology

Psychology is the science of the activities of an individual in relation to his environment. (Albert V.Carvon, 1980).

1.23.21 Self confidence

A person's belief that he or she can succeed. Self-confidence is usually specific to particular tasks, but some people seem to display it in a wide range of activities. In sport, it has long been thought of as an important determinant of performance. It tends to be self-generating: confident athletes set themselves difficult training goals and persevere until they have achieved them. (Albert V.Carvon, 1980)
1.23.22 Emotional adjustment

Emotional adjustment is the maintenance of emotional equilibrium in the face of internal and external stressors. This is facilitated by cognitive processes of acceptance and adaptation. An example would be maintaining emotional control and coping behavior in the face of an identity crisis. (Albert V. Carvon, 1980)

1.23.23 Assertiveness

Assertiveness is a trait taught by many personal development experts and psychotherapists and the subject of many popular self-help books. It is linked to self-esteem and considered an important communication skill. (Alderman, R.B. 1974)

1.23.24 Interpersonal relationship

An interpersonal relationship is a relatively long-term association between two or more people. (Alderman, R.B. 1974)

1.23.25 Stress management.

Stress management is the amelioration of stress, especially chronic stress. (Sedgeman, J.A. 2005)