

CHAPTER - I

INTRODUCTION

Numerous training procedures are in practice to improve each and every physiological and body composition profiles. Each type of training produces its own effect on fitness. Training effect describes the physiological changes that occur from regular participation in a fitness program. These basic training procedures will serve better when utilized with modification suited to the individual or a group dealt with. The best training program is that which increases the desired quality at a higher rate without causing unwanted effects. Although numerous types of studies exist in the field of physical education, a physical educationist is in need to find some means that tends to encourage students to try harder to increase their level of performance and their breadth and depth of knowledge.

Sports training aim at achieving higher performance in sports competition. In order to achieve higher performance in sports, training should be based on systematic facts and principles and it is done in a planned and systematic manner. A system most suitable for achieving higher performance has to be first made on the basis of which sports training is planned. It is always assessed, planned, organized and improved by a coach or a sports teacher or the athlete himself. The sport training aims at finding hidden reserves and makes the sports person aware of it. It also aims at greater development of the reserves. The sports person controls their day to day routine in such a manner that they are able to do training once or twice a day with high effect. It is a continuous

process of perfection, improvement and criterion of means and methods of improving sports performance and factors of performance.

Obesity is from the Latin *obesitas*, which means "stout, fat, or plump". The Greeks were the first to recognize obesity as a medical disorder. Hippocrates wrote that "Corpulence is not only a disease itself, but the harbinger of others". The Indian surgeon Sushruta (6th century BCE) related obesity to diabetes and heart disorders. He recommended physical work to help cure it and its side effects. For most of human history mankind struggled with food scarcity. Obesity has thus historically been viewed as a sign of wealth and prosperity. Obesity is still seen as a sign of wealth and well-being in many parts of Africa. This has become particularly common since the HIV epidemic began. Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness.

1.1 TRAINING

Training is not a recent discovery. In ancient time, people were trained systematically for military and Olympic endeavours. Today athletes prepare themselves for a goal through training. The major objective in training is to cause biological adaptations in order to improve performance in a specific task. To enhance physiological improvement effectively and to bring about a change, specific exercise and over load must be followed. By exercising at a level above normal, a variety of trading adaptations takes place in the body that makes it to function more efficiently.

Sports training are done for improving sports performance. Sports training is a scientifically based and pedagogically organized process which through planned and systematic, effect on performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competition". [Thiess & Schnabel, 1986]. Sports training, based on scientific knowledge, are a pedagogical process of sports perfection which through systematic effect on psycho-physical performance ability and performance readiness aims at leading the sportsman to high and the highest performance. Through active and conscious interaction with the given demands in sports training, the sportsman's personality develops according to the norms and standards of socialist society. [Harre, 1986]

1.2 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. People are considered obese when their body mass index (BMI), a measurement obtained by dividing a person's weight in kilograms by the square of the person's height in meters, exceeds 30 kg/m^2 . Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis. Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications or psychiatric illness. Evidence to support the view that some obese people eat little yet gain weight due to a slow metabolism is limited; on average obese people

have a greater energy expenditure than their thin counterparts due to the energy required to maintain an increased body mass.

Dieting and physical exercise are the mainstays of treatment for obesity. Diet quality can be improved by reducing the consumption of energy-dense foods such as those high in fat and sugars, and by increasing the intake of dietary fiber. Anti-obesity drugs may be taken to reduce appetite or inhibit fat absorption together with a suitable diet. If diet, exercise and medication are not effective, a gastric balloon may assist with weight loss, or surgery may be performed to reduce stomach volume and/or bowel length, leading to earlier satiation and reduced ability to absorb nutrients from food.

Obesity is a leading preventable cause of death worldwide, with increasing prevalence in women, and authorities view it as one of the most serious public health problems of the 21st century. Obesity is stigmatized in much of the modern world (particularly in the Western world), though it was widely perceived as a symbol of wealth and fertility at other times in history, and still is in some parts of the world. In 2013, the American Medical Association classified obesity as a disease. Excessive body weight is associated with various diseases, particularly cardiovascular diseases, diabetes mellitus type 2, obstructive sleep apnea, certain types of cancer, osteoarthritis and asthma. As a result, obesity has been found to reduce life expectancy.

1.3 MORTALITY DUE TO OBESITY

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 20–25 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 kg/m² has been associated with a doubled mortality rate among women over a 16-year period. In the United States obesity is estimated to cause 111,909 to 365,000 deaths per year, while 1 million (7.7%) of deaths in Europe are attributed to excess weight. On average, obesity reduces life expectancy by six to seven years, a BMI of 30–35 kg/m² reduces life expectancy by two to four years, while severe obesity (BMI > 40 kg/m²) reduces life expectancy by ten years.

1.4 MORBIDITY DUE TO OBESITY

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. Health consequences fall into two broad categories: those attributable to the effects of increased fat mass (such as osteoarthritis, obstructive sleep apnea, social stigmatization) and those due to the increased number of fat cells (diabetes, cancer, cardiovascular disease, non-alcoholic fatty liver disease). Increases in body fat alter the body's response to insulin, potentially leading to insulin resistance. Increased fat also creates a proinflammatory state, and a prothrombotic state.

1.5 CAUSES OF OBESITY

At an individual level, a combination of excessive food energy intake and a lack of physical activity is thought to explain most cases of obesity. A limited number of cases are due primarily to genetics, medical reasons, or psychiatric illness. In contrast, increasing rates of obesity at a societal level are felt to be due to an easily accessible and palatable diet, increased reliance on cars, and mechanized manufacturing.

A 2006 review identified ten other possible contributors to the recent increase of obesity: (1) insufficient sleep, (2) endocrine disruptors (environmental pollutants that interfere with lipid metabolism), (3) decreased variability in ambient temperature, (4) decreased rates of smoking, because smoking suppresses appetite, (5) increased use of medications that can cause weight gain (e.g., atypical antipsychotics), (6) proportional increases in ethnic and age groups that tend to be heavier, (7) pregnancy at a later age (which may cause susceptibility to obesity in children), (8) epigenetic risk factors passed on generationally, (9) natural selection for higher BMI, and (10) assortative mating leading to increased concentration of obesity risk factors (this would increase the number of obese people by increasing population variance in weight). While there is substantial evidence supporting the influence of these mechanisms on the increased prevalence of obesity, the evidence is still inconclusive.

1.6 DIET AND OBESITY

Average per capita energy consumption of the world from 1961 to 2002. The per capita dietary energy supply varies markedly between different regions and countries. It has also changed significantly over time. From the early 1970s

to the late 1990s the average calories available per person per day (the amount of food bought) increased in all parts of the world except Eastern Europe. The United States had the highest availability with 3,654 calories per person in 1996. This increased further in 2003 to 3,754. During the late 1990s Europeans had 3,394 calories per person, in the developing areas of Asia there were 2,648 calories per person, and in sub-Saharan Africa people had 2,176 calories per person. Total calorie consumption has been found to be related to obesity.

The widespread availability of nutritional guidelines has done little to address the problems of overeating and poor dietary choice. From 1971 to 2000, obesity rates in the United States increased from 14.5% to 30.9%. During the same period, an increase occurred in the average amount of food energy consumed. For women, the average increase was 335 calories per day (1,542 calories in 1971 and 1,877 calories in 2004), while for men the average increase was 168 calories per day (2,450 calories in 1971 and 2,618 calories in 2004). Most of this extra food energy came from an increase in carbohydrate consumption rather than fat consumption. The primary sources of these extra carbohydrates are sweetened beverages, which now account for almost 25 percent of daily food energy in young adults in America, and potato chips. Consumption of sweetened drinks is believed to be contributing to the rising rates of obesity.

As societies become increasingly reliant on energy-dense, big-portion, and fast-food meals, the association between fast-food consumption and obesity becomes more concerning. In the United States consumption of fast-food meals tripled and food energy intake from these meals quadrupled between 1977 and

1995. Agricultural policy and techniques in the United States and Europe have led to lower food prices. In the United States, subsidization of corn, soy, wheat, and rice through the U.S. farm bill has made the main sources of processed food cheap compared to fruits and vegetables. Calorie count laws and nutrition facts labels attempt to steer people toward making healthier food choices, including awareness of how many calories are being consumed. Obese people consistently under-report their food consumption as compared to people of normal weight. This is supported both by tests of people carried out in a calorimeter room and by direct observation.

A sedentary lifestyle plays a significant role in obesity. Worldwide there has been a large shift towards less physically demanding work, and currently at least 30% of the world's population gets insufficient exercise. This is primarily due to increasing use of mechanized transportation and a greater prevalence of labor-saving technology in the home. In women, there appear to be declines in levels of physical activity due to less walking and physical education. World trends in active leisure time physical activity are less clear. The World Health Organization indicates people worldwide are taking up less active recreational pursuits, while a study from Finland found an increase and a study from the United States found leisure-time physical activity has not changed significantly.

1.7 AEROBIC EXERCISE

Aerobic exercise is physical exercise of relatively low intensity that depends primarily on the aerobic energy generating process. Aerobic literally means "living in air", and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism. Generally, light to moderate

intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods of time. The intensity should be between 60 and 85% of maximum heart rate.

Aerobic capacity describes the functional capacity of the cardio respiratory system, (the heart, lungs and blood vessels). Aerobic capacity is defined as the maximum amount of oxygen the body can use during a specified period, usually during intense exercise. It is a function both of cardio respiratory performance and the maximum ability to remove and utilize oxygen from circulating blood. The higher the measured cardio respiratory 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 and multi-stage fitness tests can also be used to assess functional aerobic capacity for particular jobs or activities.

The degree to which aerobic capacity can be improved by exercise varies vary widely in the human population: while the average response to training is an approximately 17% increase in $VO_2\text{max}$, in any population there are "high responders" who may as much as double their capacity, and "low responders" who will see little or no benefit from training. Studies indicate that approximately 10% of otherwise healthy individuals cannot improve their aerobic capacity with exercise at all. The degree of an individual's responsiveness is highly heritable, suggesting that this trait is genetically determined.

1.8 THE HEALTH BENEFITS OF AEROBIC EXERCISE

Perhaps no area of exercise science has been more studied than the benefits of aerobic exercise. There is a mountain of evidence to prove that regular aerobic exercise will improve your health, your fitness, and much more. Here's a partial list of the documented health benefits of aerobic exercise. Colon cancer, Research is clear that physically active men and women have about a 30%-40% reduction in the risk of developing colon cancer compared with inactive individuals. It appears that 30-60 minutes per day of moderate- to vigorous-intensity physical activity is needed to decrease the risk, and there is a dose-response relationship, which means that the risk declines the more active you are. Breast cancer, There is reasonably clear evidence that physically active women have about a 20%-30% reduction in risk compared with inactive women. Like colon cancer, it appears that 30-60 minutes per day of moderate- to vigorous-intensity physical activity is needed to decrease the risk, and it is likely that there is a dose-response relationship as well. Prostate cancer, Research is inconsistent regarding whether physical activity plays any role in the prevention of this cancer. Lung cancer, There are relatively few studies on physical activity and lung cancer prevention.

The available data suggest that physically active individuals have a lower risk of lung cancer; however, it is difficult to completely account for the risks of active and passive cigarette smoking as well as radon exposure. Other cancers, There is little information on the role of physical activity in preventing other cancers. In one study, aerobic exercise performed five days per week for 30-35 minutes for six weeks at 80% of maximal heart rate reduced fatigue in women

being treated for cancer. In another study, 10 weeks of aerobic exercise at 60% of maximum heart rate for 30-40 minutes, four days per week, reduced depression and anxiety in female cancer patients. Aerobic exercise isn't a panacea when it comes to cancer, but evidence suggests that it certainly can help.

Osteoporosis is a disease characterized by low bone density, which can lead to an increased risk of fracture. According to the National Osteoporosis Foundation, osteoporosis is responsible for more than 1.5 million fractures annually, including over 300,000 hip fractures, 700,000 vertebral fractures, 250,000 wrist fractures, and 300,000 fractures at other sites. The good news is that exercise may increase bone density or at least slow the rate of decrease in both men and women. It may not work for everyone, and the precise amount and type of exercise necessary to accrue benefits is unknown.

Most of us who exercise regularly understand that exercise can elevate our mood. There have been a number of studies investigating the effects of exercise on depression. In one of the most recent studies, it was shown that three to five days per week for 12 weeks of biking or treadmill for approximately 30 minutes per workout reduced scores on a depression questionnaire by 47%. It's not a substitute for therapy in a depression that causes someone to be unable to function, but for milder forms of depression, the evidence is persuasive that it can help.

No study has been more conclusive about the role of lifestyle changes (diet and exercise) in preventing diabetes than the Diabetes Prevention Program.

It was a study of more than 3,000 individuals at high risk for diabetes who lost 12-15 pounds and walked 150 minutes per week (five 30-minute walks per day) for three years. They reduced their risk of diabetes by 58%. That's significant considering there are 1 million new cases of diabetes diagnosed each year. Aerobic exercise can also improve insulin resistance. Insulin resistance is a condition in which the body doesn't use insulin properly, and this condition can occur in individuals who do and do not have diabetes. Insulin is a hormone that helps the cells in the body convert glucose (sugar) to energy. Many studies have shown the positive effects of exercise on insulin resistance. In one, 28 obese postmenopausal women with type 2 diabetes did aerobic exercise for 16 weeks, three times per week, for 45-60 minutes, and their insulin sensitivity improved by 20%.

The list of studies that show that aerobic exercise prevents or reduces the occurrence of cardiovascular disease is so long that it would take this entire article and probably five others just like it to review all of the research. One of the most important is one of the earliest. In a study of more than 13,000 men and women, it was shown that the least fit individuals had much higher rates of cardiovascular disease than fit individuals -- in some cases, the risk was twice as high. Aerobic exercise works in many ways to prevent heart disease; two of the most important are by reducing blood pressure and allowing blood vessels to be more compliant (more compliant means that they become less stiff and it's less likely for fat to accumulate and clog up the vessels). Results like these have been proven over and over again.

1.9 ANAEROBIC EXERCISE

Anaerobic exercise is exercise intense enough to trigger lactic acid formation. It is used by athletes in non-endurance sports to promote strength, speed and power and by body builders to build muscle mass. Muscle energy systems trained using anaerobic exercise develop differently compared to aerobic exercise, leading to greater performance in short duration, high intensity activities, which last from mere seconds to up to about 2 minutes. Any activity lasting longer than about two minutes has a large aerobic metabolic component.

Anaerobic metabolism, or anaerobic energy expenditure, is a natural part of whole-body metabolic energy expenditure. Fast twitch muscle (as compared to slow twitch muscle) operates using anaerobic metabolic systems, such that any recruitment of fast twitch muscle fibers leads to increased anaerobic energy expenditure. Intense exercise lasting upwards of about four minutes (e.g., a mile race) may still have a considerable anaerobic energy expenditure component. Anaerobic energy expenditure is difficult to accurately quantify, although several reasonable methods to estimate the anaerobic component to exercise are available. In contrast, aerobic exercise includes lower intensity activities performed for longer periods of time. Activities such as walking, long slow runs, rowing, and cycling require a great deal of oxygen to generate the energy needed for prolonged exercise (i.e., aerobic energy expenditure). In sports which require repeated short bursts of exercise however, the anaerobic system enables muscles to recover for the next burst. Therefore training for many sports demands that both energy producing systems be developed.

There are two types of anaerobic energy systems: 1) the high energy phosphates, ATP adenosine triphosphate and CP creatine phosphate; and 2) anaerobic glycolysis. The high energy phosphates are stored in very limited quantities within muscle cells. Anaerobic glycolysis exclusively uses glucose (and glycogen) as a fuel in the absence of oxygen or more specifically, when ATP is needed at rates that exceed those provided by aerobic metabolism; the consequence of rapid glucose breakdown is the formation of lactic acid (more appropriately, lactate at biological pH levels). Physical activities that last up to about thirty seconds rely primarily on the former, ATP-CP phosphagen system. Beyond this time both aerobic and anaerobic glycolytic metabolic systems begin to predominate.

The by product of anaerobic glycolysis, lactate, has traditionally been thought to be detrimental to muscle function. However, this appears likely only when lactate levels are very high. Elevated lactate levels are only one of many changes that occur within and around muscle cells during intense exercise that can lead to fatigue. Fatigue, that is muscular failure, is a complex subject. Elevated muscle and blood lactate concentrations are a natural consequence of any physical exertion. The effectiveness of anaerobic activity can be improved through training.

1.10 THE HEALTH BENEFITS OF ANAEROBIC EXERCISE

The early stage of any exercise is anaerobic. Sprinting, weight lifting, push-ups, or jumping, in fact any short burst of exertion and high-intensity movement, is considered an anaerobic exercise. There is a reason why it is called anaerobic (without air). During short, intense exercise, our body demands

more oxygen than it is available, so it depends on energy that is stored in the muscles. That is the key for its role in any fitness program. Anaerobic exercise is not meant to burn off fat – you need oxygen for that – its main role is to build strong muscles.

Anaerobic exercise basically means "without air or oxygen." These are high-intensity exercises which are performed in a short time frame. The main difference between anaerobic and aerobic exercise lie on the body's requirement of oxygen as fuel for the activity being performed. Aerobic exercises are often low-intensity physical activities which are performed for longer durations. On the other hand, anaerobic exercises are often intense physical activities which last from a few seconds up to two minutes. Some of the popular forms of anaerobic exercises are sprinting, weight lifting and jumping.

Like aerobic exercises, doing anaerobic exercise can prove beneficial to one's health especially if properly integrated into a regular exercise routine. Performing anaerobic exercises strengthens the bones. Regularly doing anaerobic training can help improve bone density, therefore strengthening them. Osteoporosis usually occurs as a person ages, thus anaerobic exercises can be a good line of defense before this condition sets in. People may still perform anaerobic exercises after being diagnosed with bone-related disorders under the supervision of their health care providers. Anaerobic training is also ideal for faster metabolism and reduced fat deposits. The food we eat are turned into sugar which fuels our bodies with energy. The excess amount of sugar is stored in the body and become fat. Since these exercises help build more lean muscles,

metabolism automatically revs up. Leaner muscles require more calories to burn, thus leaving little room for fat deposits.

People who regularly perform anaerobic exercises also see significant improvements in their balance and strength, two qualities which come in handy later on in life. Exercises such as weight lifting put much emphasis on strength and balance which may help prevent slips and falls as people grow older. There is also a marked improvement in joint health while indulging in regular anaerobic training. Because the body build more lean muscles and lesser mass while performing these exercises, a portion of the body weight is taken off which relieve pressure from the joints. It helps in projecting good self-image. Because anaerobic exercises often result in a fitter and leaner version of the person performing it, he will find that flexing his muscles is easier to attain. Successfully achieving the kind of body one desires does not only improve physical health, but also boosts positive self-image. In turn, the person becomes more confident and holds a more positive perspective.

1.11 OBJECTIVES OF THE STUDY

1. The major objective of the study was to determine the changes on selected physiological variables due to the effect of aerobic and anaerobic training.
2. The major objective of the study was to determine the changes on selected body composition profiles due to the effect of aerobic and anaerobic training
3. To compare how far the aerobic training differ from anaerobic training in their influences on selected physiological and body composition profiles.

1.12 STATEMENT OF THE PROBLEM

The purpose of the present study was to find out the effect of aerobic and anaerobic training on selected physiological and body composition profiles among middle aged obese women.

1.13 HYPOTHESES

1. It was hypothesized that, the effect of aerobic training may improve the selected physiological variables and body composition profiles among middle aged obese women.
2. It was hypothesized that, the effect of anaerobic training may improve the selected physiological variables and body composition profiles among middle aged obese women.
3. It was hypothesized that, the effect of aerobic training may better than the anaerobic training in the improvement of the selected physiological variables and body composition profiles among middle aged obese women.

1.14 DELIMITATIONS

1. To achieve the purpose of the study, forty-five obese women in and around from Namakkal district, Tamilnadu, India were selected as subjects.
2. The age of the subjects ranged from 35 to 45 years.
3. The selected subjects (N=45) were be classified into three equal groups of fifteen each (n=15) at random. Group-I underwent aerobic training, group-II underwent anaerobic training and group III will act as control.

4. The duration of the training period was restricted to twelve weeks and the number of sessions per week was confined to three.

1.15 LIMITATIONS

1. The growth and development of the subject if any, during the period of experimentation and the possible influence on the dependent variable could not be controlled.
2. Though the subjects were motivated verbally, no attempt was made to differentiate the motivation level during the period of training and testing.
3. The investigator did not take any effort to control or assess the quality and quantity of food intake by each participant.
4. The quantum of physical exertion, life style and physiological stress and other factors that affect the metabolic functions were also considered as limitations.
5. The change in climatic conditions such as temperature, atmospheric pressure, humidity, etc., during the training as well as testing period could not be controlled. So, their influence on the results of the study was recognized as one of the limitations.
6. Apart from the training program the involvement of the subjects in their daily routine are not taken into consideration.

1.16 SIGNIFICANCE OF THE STUDY

Scientists, teachers or coaches use different means to achieve certain goals. Before adopting a method to achieve a goal, one should assess thoroughly the merits and demerits of the existing methods to achieve the goal. Say in selecting a method to develop certain physiological variables and body

composition profiles, a coach or a trainer should have a complete understanding of the methods in practice and if necessary, she should be able to modify the basic methods in such a way that suits best her subjects. Adding to this he should keep in mind the equipment required and the facilities available. The results of the study would also help the middle aged obese women in the development of physiological variables and body composition profiles.

1. The study may helps to the physical educationists and coaches to build the best method of training to develop the physiological variables and body composition profiles.
2. This study also may helps to the coaches to prepare the suitable training schedules for the improvement of the performance of the obese women.
3. It also may helps to know about the importance of aerobic and anaerobic training for the obese women.

1.17 DEFINITIONS OF THE TECHNICAL TERMS

1.17.1 Aerobic

Aerobic literally means "with oxygen", and refers to the use of oxygen in muscles' energy-generating process. Aerobic exercise includes any type of exercise, typically those performed at moderate levels of intensity for extended periods of time, that maintains an increased heart rate. In such exercise, oxygen is used to "burn" fats and glucose in order to produce adenosine triphosphate, the basic energy carrier for all cells.

1.17.2 Anaerobic

Anaerobic means "without air" or "without oxygen." Anaerobic exercise is short-lasting, high-intensity activity, where your body's demand for oxygen

exceeds the oxygen supply available. Anaerobic exercise relies on energy sources that are stored in the muscles and, unlike aerobic exercise, is not dependent on oxygen from (breathing) the air.

1.17.3 Breath holding Time

This is the duration of voluntary holding of the breathing after the maximum inhaling. The holding of breath is performed for a maximum period, which an individual is able to withstand, without restoring to normal breathing.

1.17.4 Systolic Blood Pressure

The pressure exerted on the vessel walls during ventricular contraction, measured in millimeters of mercury by the sphygmomanometer.

1.17.5 Diastolic Blood Pressure

The pressure exerted by the blood on the vessel walls during the resting portion of the cardiac cycle, measured in millimeters of mercury by a sphygmomanometer.

1.17.6 Resting Pulse Rate

Resting pulse rate as the distension of the arterial walls at the beginning of systolic ejection of blood which is not confined to aorta but travels down the arteries as a wave followed by a wave of recoil. The arteries that lie close to the body such as radial artery of the wrist, the arrival of the wave of distension and subsequent recoil may be felt as a distinct throbbing pulse which offers a convenient method of counting the pulse rate.

1.17.7 Aerobic Power

The maximum rate at which energy is provided by aerobic respiration. Aerobic power is dependent on the ability of the respiratory and circulatory systems to transport oxygen from the air to the respiring tissues, and the ability of the tissues to use the oxygen to break down metabolic fuels. Aerobic power is usually measured in terms of oxygen consumption.

1.17.8 Anaerobic power

Anaerobic power is the amount of work performed using primarily an aerobic energy system

1.17.9 Body Weight

Body Weight is a person's mass or weight. Body weight is measured in kilogram.

1.17.10 Lean Body Mass

The portion of body weight that is lean ie. Not fat. Lean body mass is measured by $\text{Lean Body Mass (kg)} = \text{body weight (kg)} - \text{Fat Mass (kg)}$.

1.17.11 Fat Mass

The portion of body weight that is fat. Fat mass is measured by $\text{fat mass (kg)} = \text{percentage fat} \times \text{body weight (kg)}$.

1.17.12 BMI

Body mass index is a key index for relating weight to height. BMI is a person's weight in kilograms (kg) divided by his or her height in meters squared.