EFFECT OF AEROBIC EXERCISES COMBINED WITH CIRCUIT TRAININGON BODY WEIGHT MANAGEMENT: THE CASE OF SELECTED MALE PARTICIPANTS IN WOLISO TOWN HEALTH CLUB, SOUTH WEST SHOA ZONE, OROMIA REGIONAL STATE, ETHIOPIA

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Effect of Aerobic Exercises Combined With Circuit Training on Body Weight Management: The Case of Selected Male Participant in Woliso Town Health Club, South West Shoa Zone, Oromia Regional State, Ethiopia

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As Thesis research advise hereby certify that we have read and evaluated this thesis entitled' **Effect of Aerobic Exercises Combined With Circuit Training on Body Weight Management: The Case of Selected Male Participant in Woliso Town Health Club, South West Shoa Zone, Oromia Regional State, Ethiopia.'** prepared by Barnabas Nigus Getahun**.** We recommend that should be accepted as fulfilling the Thesis requirements.

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As members of the Board of Examiners the master of education Thesis open defense examination, we certify that we have read and evaluated the thesis prepared by Barnabas Nigus, Getahun and examined the candidate. We recommend that the Thesis can be accepted as fulfilling the Thesis requirement for the Degree of Master of education in teaching physical education.

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DEDICATION

I dedicated this thesis manuscript to my beloved parents Abi and Emi, grand mama Yshasheworek Tsehayu brother and sisters (Xavi,Kali,Tesgi,Bsteg,Azaru) for nursing me with affection and for their immense contribution in success of my life.

SATEMENT OF THE AUTHOR

First, I declare that this thesis is my genuine work and that all source of materials used for this Thesis have been duly acknowledged .This thesis has been submitted in partial fulfillment of the Requirement for MEd degree at Haramaya University in 'physical education '' and deposited at the university library to be made available to borrowers under rules of library solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any Academic Degree, diploma or certificate.

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BIOGRAPHICL SKETCH

The author was born on October 1981 E.C in Northern part of Ethiopia specific place Alemata. He attended his primary and junior school at Kobo Ewket Chora and Dingakulel schools. He attended secondary school in Kobo high school and preparatory school attended in Woldiya higher preparatory school. On 2000 he joined Adama University and graduated with BEd degree in physical education in 2002 E.C Then he served for the last 6 years in south west Shoa Wenchi Werda two high schools (Darian and Chitu secondary school) being physical education teacher .

Finally, in July 2006 E.C he joined Harmaya university postgraduate directorate program to pursue his MEd. degree in the field of physical education.

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ACRONYMS AND ABBREVIATIONS

AE	Aerobic Exercise
AECT	Aerobic Exercise and Circuit Training
BMI	Body Mass Index
BWCT	Body Weight Circuit Training
CG	Control Group
CHD	Coronary Heart Disease
CT	Circuit Training
CVD	Cardio Vascular Disease
DEXA	Dual-Energy X-Ray Absorption-Tery
DTT	During Training Test
EPHA	Ethiopian Public Health Association
IBW	Ideal Body Weight
PoT	Post Test
PT	Pre Test
SPSS	Statistical Package Software for Social Sciences
TG	Treatment Group
WC	Waist Circumference
WHO	World Health Organization
WRH	Waist Hip Ratio

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ABSTRACT

The aim of this study was to investigate the effects of aerobic exercise combined with circuit training on body weight management. In this study, 40 male recruited as Subjects. They were divided randomly into two groups equal in number exercise group (n=20) and control group (n=20) out of 40 subjects two subjects from TG two subjects from CG with draw training only 36 were able to accomplish the study .The first group (Treatment group) included 20 males treated with AECT 12 weeks. The second group (control group) included 20 males no treatment was given. The subject ages ranged from 22-35 years old, and over weighted with >25 BMI kg/m^2 participated in this study. Participants joined sessions for 45-60 min per day, at 55-69% of (MHR); 3 days per week, duration of the study was 3months from November 2016 to january2017. Body weight, BMI, waist circumference, hip circumference and waist to hip ratio were measured pre, during and post the training for both groups. Data was analyzed by using SPSS statistical package software (version 16.0 for window). Paired sample T test was employed for pre and posttest difference assessment. After 12 weeks training *The obtained results showed that there was a statistically significant* ($p<0.05$) reduction was observed *on Bodyweight, BMI, Waist circumference, Hip Circumference, Waist hip ratio between pre test and post test .The post test values of the mean difference was ,BW (3,8%), BMI (3.7%), WC (7.3) HC (2.3%) and WHR(6%) on TG participants . Statistically no significant difference between pre test and post test result on BW, BMI, WC, HC and WHR among CG participants. Accordingly, it could be conclude that the aerobic exercise combined with circuit training is effective in body weight management. In consequences, regular combined mode of exercises can contribute great role for body weight management.*

Key Words*:* Aerobic exercise, Anthropometric measurement, Bodyweight Exercise, Bodyweight management, Circuit training

1. INTRODUCTION

This section provides over views about background of the study, statement of the problem, objectives of the study, with the research hypothesis that in connection with the objectives, the significance that the current study expected and scope of the study part of this chapter.

1.1. Background of the Study

"Aim for a healthy body weight" Health and longevity threatened when a person is either overweight or underweight. Excess body weight and fatness pose a threat to both the quality and quantity of one's life. In today's society, leanness is often equated with health, fitness, self-control, beauty, success. Obesity on other hand is considered as undesirable for reasons that are often more related body appearance concern than to actual or potential medical complication (lauren1997). Therefore, Healthy weight is vital to a healthy and longer life. One will learn about weight control principles and practices, as well as guidelines for designing exercise programs for weight loss, weight gain and body composition change. Individuals with body fat levels falling at or near the extremes of the body fat continuum are likely to have serious health problems that reduce life expectancy and threaten their quality of life. (Heyward, 2002)

In 2014, more than 1.9 billion adults 18 years and older over weight of these over 600milion were obese. Each year, it is estimated at least 2.8 million people die as result of being overweight or obese (WHO, 2016). The prevalence of overweight and obesity has increased substantially in all societies across the globe during last three Decades, and all indications are that this trend is likely to continue unabated in the coming years. This is a major public health concern because obesity has far-reaching negative effects on health (Petri W, 2016)

Therefore obese individuals have shorter life expectancy and greater risks of increase one's risk of developing serious CVD, CHD, hypercholesterolemia, hypertension, and diabetes mellitus, certain cancers, osteoarthritis, musculoskeletal and reproductive disorders, and psychosocial problems such as, depression, low self-esteem, body dissatisfaction prejudice and discrimination.

Generally Overweight and obesity health consequences range from increased risk of premature death, to serious chronic conditions that reduce the overall quality of life

Over weight and Obesity multi factorial; however the fundamental cause of age, genetic, environment, eating pattern, sedentary life lifestyle, metabolic rate and other factors medications (anti-depressant) psychological problems, diseases, social issues are mentioned.

Multiple methods for estimations of body fatness have been developed. Anthropometric measurements provide approximate estimates of fatness and have the advantages of being quick, cheap and readily available. The most common methods used in clinical and epidemiological settings include BMI, WC, WHR and skin fold caliper. For more precise measures of total body fat, dual energy x-ray absorptiometry (DXA) is often used.

Body fat distribution varies. Some people may be apple-shaped (Android) and other people may be pear-shaped (Gynoid). The terms android obesity and Gynoid obesity refer to the localization of excess body fat, mainly in the upper or lower body. Android obesity (apple shaped) is more typical of males; ganoids obesity (pear shaped) is more characteristics of females. However, some men may have Gynoid obesity, and some women have android obesity. Other terms are also used to describe types of obesity and regional fat distribution. Android obesity is frequently simply called upper-body obesity, and Gynoid obesity is often described as lower-body obesity. (Heyward, 2002) .contrast over weight and obesity kills more people than underweight.

The incidence of obesity is increasing rapidly. Research efforts for effective treatment strategies still focus on diet and exercise. Physical activity play an important role in combating this major health problem by encouraging a physically active lifestyle and by planning exercise programs and scientifically sound diets for one's. Restricting caloric intake and increasing caloric expenditure through physical activity and exercise are effective ways of reducing body weight and fatness while normalizing blood pressure and blood lipid profiles. (Morrow, et al., 2005)

Exercise is associated with an increase in energy expenditure, thus promoting changes in body composition and bodyweight while keeping dietary intake constant. (Stigler and Conifer, 2006) Most people know the benefits of regular physical exercises. However most adults and many children still lead a relative sedentary life style are not active enough to achieve many health benefits. Worldwide it is estimated that 60 percent of adults are simply not active enough to benefit their health (WHO, 2003b).the overall, physical inactivity or sedentary trend is worse poor in urban areas most of the world's population live in countries. It is well known that physical exercise is perquisite for healthy life beyond reduction excess fat.

Over weight and obesity is increasing at an alarming rate in our country and the problem appears to be increasing at remarkable rate in adults as well as children .Overweight and obesity relatively common and prevalent urban than rural populations . The present study was concerned with examining the problem of overweight in woliso more specifically the problem under investigation was to determine the effects of aerobic exercise and circuit training on body weight management among male adults in Woliso town.

1.2. Statement of the Problem

The world prevalence of overweight and obesity more than doubled between 1980 and 2014 (WHO, 2014).A report compiled by the EPHA in 2012 indicated that high prevalence of overweight, obesity and associated problems blood pressure, type2 diabetes, CHD ,some cancer were widely prevalent in Ethiopia . This shows that overweight, obesity is becoming a growing problem globally as well as in our country. The prevalence of overweight and obesity and their predictors are not well documented in the developing countries especially in Ethiopia.

The fundamental cause of overweight and obesity is an energy imbalance between calories consumed and calories expended there has been an increased intake of energy dense foods that are high in fat and an increase in physical inactivity due to increasingly sedentary nature of many forms of work changing modes of transportation and increasing urbanization.

Obesity a major risk factor for no communicable diseases such as cardiovascular diseases (mainly heart disease and stroke), diabetes, musculoskeletal disorders (especially osteoarthritis – a highly disabling degenerative disease of the joints), some cancers (including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon). Overweight and obesity, as well as their related no communicable and diseases, are largely preventable by making the choice of healthier foods and regular physical activity and obesity.

The purpose of the present study was to investigate the effect of aerobic exercises and circuit training on body weight management of male participant in Woliso town health club. The researcher's personal experience, observations and different documents witnessed with existence of problem in case of our country particularly weliso town the findings it is necessary to promote physically active life style and develop positive attitudes towards physical Exercise among community in order to maintain healthy

Weight. The researcher has gone through various related research studies completed on this area based on the available, literature, keeping the above logical concepts and gaps the researcher answer the following questions.

1. What change will bring combination of Aerobic with Circuit training on body weight management?
2. Does Aerobic combined with Circuit training have significant effect on the anthropometric measurements of the subjects?
3. Is it aerobic exercise combined with circuit training has an effective method to prevent over weight?
4. Which component of the anthropometric measurement variables would be more changes or improvement after 12 weeks AECT training?

1.3. Scope of the Study

The study were focused on examining effects of aerobic exercise combined with body weight circuit training body weight management in the case of selected male volunteers participating in woliso town health club, which is located in Oromia regional state, southwest showa zone. To setup the study in manageable manner and also it is impossible to cover all the population under the experimental study due to lack of time, money was selected from woliso health club members 40 male adults who are BMI >25 and volunteers and the age of 22-35 to be participant of the study.

1.4. Significance of the Study

The aim of this study was investigate the effect of AE combined CT on weight management of male adult of weliso town. The findings would help communities to maintain healthy body weight through physical exercises .This lead to making appropriate choice of life style and helps to increase people's participation in physical activities and joining health clubs as well as mass sports .Further these studs have the following significance;

- ❖ It may help maintain an active life style to influence the physical activity participation of the community and society.
- ❖ It may provide selective physical exercise for body weight management.

Generally, the study would give suggestions and clues for fitness professionals, self-trainers, athletes as well as coaches. The researcher has taken the necessary measurement to do this research work so this study used as a bridge to another research in the area.

1.5. Objective of the Study

1.5.1. General Objective

The general objective of this study was to investigate the effects of aerobic exercise combined with circuit training (AECT) on body weight management over weight male adults after 12 weeks training program .To achieve this general objective ,the following specific objective has been set.

1.5.2. Specific Objective

The specific objectives of the study were:

- To find out the effects of aerobic exercises combined with circuit training on body weight management.
- To assess selected anthropometrics variables status of male participants
- To examine the body weight changes of experimental group when compared with control group after intervention.
- To compare and contrast the effects of aerobic exercises combined with circuit training on each anthropometric measurement variables.

2. REVIEW OF RELATED LITERATURE

Review related literature is basic framework of the study in order to create linked from the past findings that serve as ladder for the present investigation. Different theories, scholar articles component of the chapter brief review of the literature related to the major topic were described. these are the concept of body weight management, body composition ,body type, body composition measurement, classification of body weight, types of obesity, determinant factors of obesity ,consequence and risk of overweight and obesity, preventive ,treatment method of overweight and obesity discussed.

2.1. Concept of Body Weight Management

Weight management means keeping body weight at a healthy level. The subject of weight management is a complex and controversial public health issue for all individuals. Most people agree that overweight and obesity have risen and that poor nutrition and physical activity habits play an important role. However, not everyone agrees on how to reverse this trend. Some researchers and clinicians argue that the health risks for overweight and obese individuals are so great that the only way to decrease the risk is weight loss. Others point to study results indicating that overweight/obese individuals can reduce their health risks by becoming physically fit through exercise and healthy food choices, but not necessarily losing weight.

Reaching and maintaining a healthy weight is important for overall health and can help you prevent and control many diseases and conditions. If you are overweight or obese, you are at higher risk of developing serious health problems, including heart disease, high blood pressure, type 2 diabetes, gallstones, breathing problems, and certain cancers. This might indicate the incidence of disease, eating disorders or under-nourishment (Goon *et al.,* 2006).

Body composition has been known to be one of the major health-related components of physical fitness that is affected by body weight and interconnected with muscles, fat, bone, and other important body tissues. Sometimes though, this element of a larger whole is reduced to fat and fat-free mass, and assessed as a body fat percentage and total body weight (in kilograms) (Lindsay *et al*., 2013:2).An individual with an excessive percentage of body fat may be at risk of diseases such as cardiac disorders, musculoskeletal injuries ,degradation, and reproductive disorders, whereas body fat percentage that is lower than 6-10% to 12-15% in boys and girls

respectively, could lead to negative effects weight gain. The general goals of weight loss and management are: (1) at a minimum, to prevent further weight That is why maintaining a healthy weight is so important: It helps lower risk for developing these problems, help, and gives more energy to enjoy life (2) to reduce body weight; and (3) to maintain a lower body weight over the long term.

2.1.1. Body Weight

The term human body weight is used colloquially and in the biological and medical sciences to refer to a person's mass or weight. Body weight is measured in kilograms, a measure of mass, throughout the world; although in some countries such as the United States, it is measured in pounds, or as in the United Kingdom, stones and pounds. Excess or reduced body weight is regarded as an indicator of determining a person's health, with body volume measurement providing an extra dimension by calculating the distribution of body weight. (Walpole, Sarah 2012***)***

Table 1. Average weight around the world

Region	Adult population (millions)	Average weight	Overweight population total population
Africa	535	60.7 kg(133.8 lb)	28.9%
Asia	2,815	57.7 kg (127.2 lb)	24.2%
Europe	606	70.8 kg (156.1 lb)	55.6%
Latin America and Caribbean	386	67.9 kg (149.7 lb)	57.9%
North America	263	80.7 kg (177.9 lb)	73.9%
Oceania	24	74.1 kg (163.4 lb)	63.3%
World	4,630	62.0 kg (136.7 lb)	34.7%

Source**:** https://en.wikipedia.org/wiki/Human_body_weight

2.2. Body Type or Somatotypes with Over Weight and Obesity

Each one of us in her it's a unique body type. Even though the media would have us think otherwise, there are really many healthy and normal body types. For ease of reference, body types have been categorized into three main types, and those types have been further categorized as blends of the three main types. Each body type has advantages over the others for certain activities, but a person with any body type can be healthy and fit and look great. The average, endomorphs were heavier, taller, and fatter than mesomorphsor ectomorphs, that mesomorphs had greater fat-free weights and were shorter than endomorphs or ectomorphs, and that

ectomorphs had less fat and lower bodyweights than mesomorphs or endomorphs. Thus, these findings suggest a general association between body structure and somatotype and infer that body fat is dependent on somatotype. (https://www.more-life.co.uk)

2.2.1. Ectomorphs

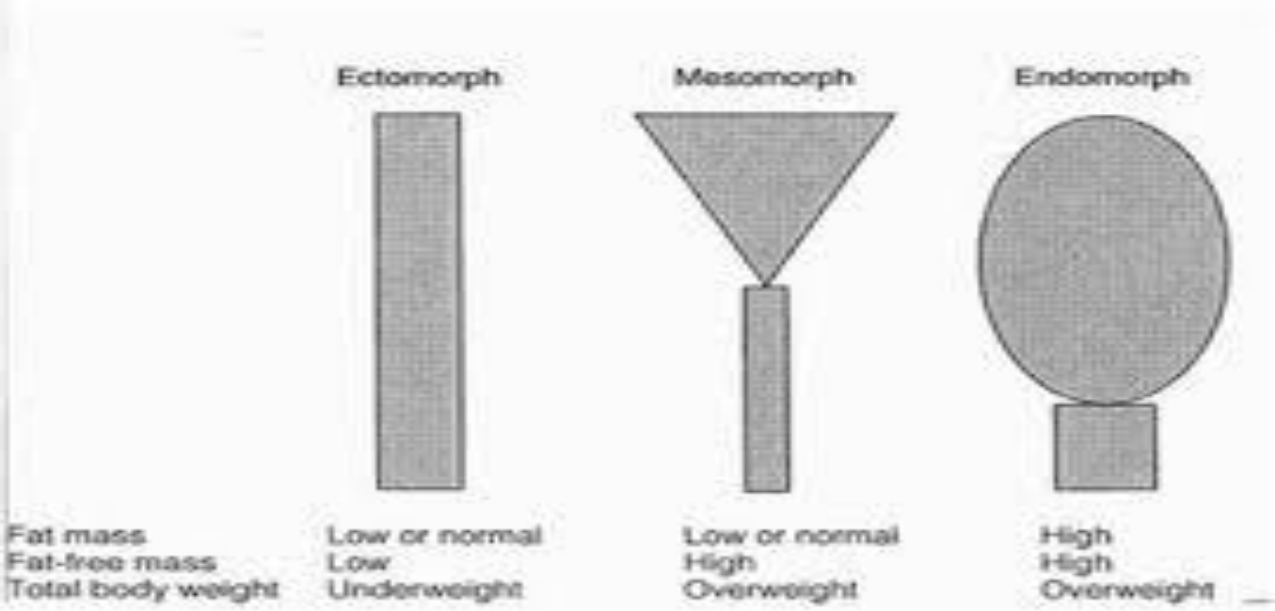
Are generally tall and thin and have long arms and legs. These people have difficulty gaining weight and muscle no matter how much they eat or how hard they weight train. They have the body type tend to see in ballet dancers, runway models, long-distance runners, and some basketball players. A very small proportion of the population has this type of body. (https://www.more-life.co.uk)

2.2.2. Mesomorphs

Are generally muscular, shorter, and have stocky arms and legs. These people are strong and tend to gain muscle mass when they do strength training. They may find it difficult to lose weight. They excel in power sports like soccer, softball, vaulting in gymnastics, and sprinting events in track and field. (https://www.more-life.co.uk)

2.2.3. Endomorphs

Generally shaped like apples or pears and carry more body fat. Their bodies resist losing weight and body fat no matter how restrictive they are with their eating. In fact, the more they “diet,” the more their metabolisms slow down to resist weight loss. These people are better able to handle long periods of starvation and famine (which was a benefit to our ancestors). Sports they excel at are distance swimming, field events, and weight lifting.(https://www.more-life.co.uk)



Source; https://www.google.com.et/search

Figure 1. Somatotypes

2.3. Body Composition

The body is composed of water, protein, minerals, and fat. A two-component model of body composition divides the body into a fat component and fat-free component. Body fat is the most variable constituent of the body. The total amount of body fat consists of essential fat and storage fat. Fat in the marrow of bones, in the heart, lungs, liver, spleen, kidneys, intestines, muscles, and lipid-rich tissues throughout the central nervous system is called essential fat, whereas fat that accumulates in adipose tissue is called storage fat. Essential fat is necessary for normal bodily functioning.

The essential fat of women is higher than that of men because it includes sex-characteristic fat related to child-bearing. Storage fat is located around internal organs (internal storage fat) and directly beneath the skin (subcutaneous storage fat). It provides bodily protection and serves as an insulator to conserve body heat. The relationship between subcutaneous fat and internal fat may not be the same for all individuals and may fluctuate during the life cycle. Lean body mass represents the weight of muscles, bones, ligaments, tendons, and internal organs. Lean body mass differs from fat-free mass. Since there is some essential fat in the marrow of bones and internal organs, the lean body mass includes a small percentage of essential

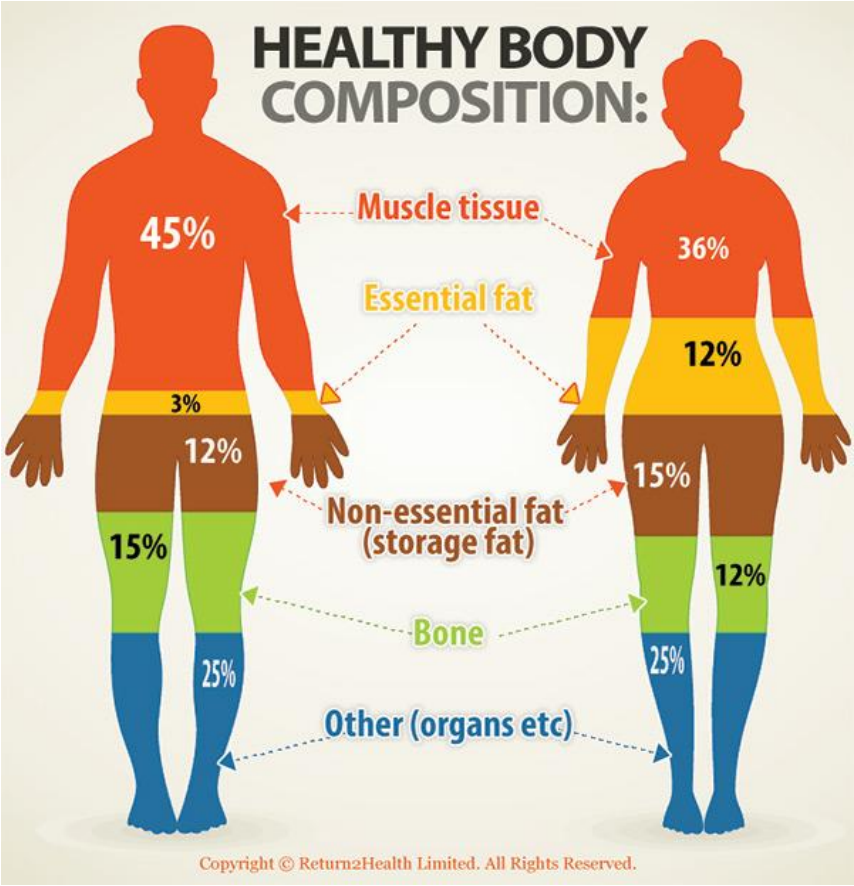
fat. However, with the two-component model of body composition, these sources of essential fat are estimated and subtracted from total body weight to obtain the fat-free mass. Practical methods of assessing body composition such as skin folds, bioelectrical impedance analysis (BIA), and hydrostatic weighing are based on the two-component (fat and fat-free mass) model of body composition. Our bodies require essential fat because it serves as an important metabolic fuel for energy production and other normal bodily functions.

Normal body functions may bed is disrupted if body fat falls below the minimum level recommended for men (5%) and women (15%). The body fat ranges for optimal health (18%-30%) for women and (10%-25%) for men are based on several epidemiological studies of the general population. Body fat percentages for optimal fitness and for athletes tend to be lower than optimal health values because excess fat may hinder physical performance and activity. When prescribing ideal body fat for a client, use a range of values rather than a single value to account for individual differences. After age 20, expect at least 1-3% fat gain per decade up to the age of 60; thereafter fatness declines gradually. In addition, there is approximately a 2% loss of bone mass per decade in older populations. As a result of these changes, men and women who weigh the same at age 60 as they did at age 20 may actually have double the amount of body fat unless they have been physically active throughout their life (Wilmore, *et* al., 1986)

Body composition is a key component of an individual's health and physical fitness profile. Obesity is a serious health problem that reduces life expectancy by increasing one's risk of developing coronary artery diseases, etc. Too little body fat also poses a health risk because functions. Essential lipids, such as phospholipids, are needed for cell membrane formation: nonessential lipids, like triglycerides found in adipose tissue, provide thermal insulation and store metabolic fuel. In addition, lipids are involved in the transport and storage of fat-soluble vitamins (A, D, E and K) and in the functioning of the nervous system and the reproductive system, as well as in growth and maturation during pubescence. (Morrow, et al., 2005)

Knowledge of the typical body composition of athletes in a sport is helpful in determining suitable target weights and in evaluating the effects of training programs. Unfortunately, the ideal weight and fat content of an athlete for optimum performance are not known precisely. Extensive data are available on wrestlers due to research on weight reduction and the need to

establish minimum weight. Adolescent wrestlers are especially of concern because of potential effects of extreme weight loss on health and growth (Sinning, 1996)



Source; https://www.google.com.et/search

Figure 2. Healthy body composition

2.4. Body Composition Measurement

Body composition can be estimated through various techniques from Field-based tests requiring only a calculator or tape measure to advanced tests conducted in clinical or laboratory setting performed by trained technician. The most Common and accessible methods of exploring the levels of adiposity include body mass index (BMI), waist circumference, skin folds and the other sophisticated measurement bioelectrical impedance analysis, dual–energ x-ra absorpthiom-etry(DEXA) under water weighing .according to Why measure body composition?

- Baseline assessment prior to exercise program and or diet plan
- To help athletes determine the best body composition for performance.
- To monitor fat and fat free weight in patients with diseases.

- To track long-term changes that occur in body fat and fat free mass with ageing.
- To assess underweight or anorexic individuals
- Accurately assess lean and fat mass in overweight individuals
- To assess the decrease in body fat weight that occurs in response to a weight management program. (David. N2011)

2.4.1. Body Max Index (BMI)

Body mass index (BMI) was invented by a Belgian mathematician, Adolphe Quetelet, who was born in 1796.A calculation of body weight and height indices for deter mining degree of obesity the most common formula for body mass index is body weight In kilograms divided by height in meters squared, and is also the Quetelet index. It has been seen as a useful guideline for approximating a healthy weight and for carrying out surveys of populations. (David. N2011)

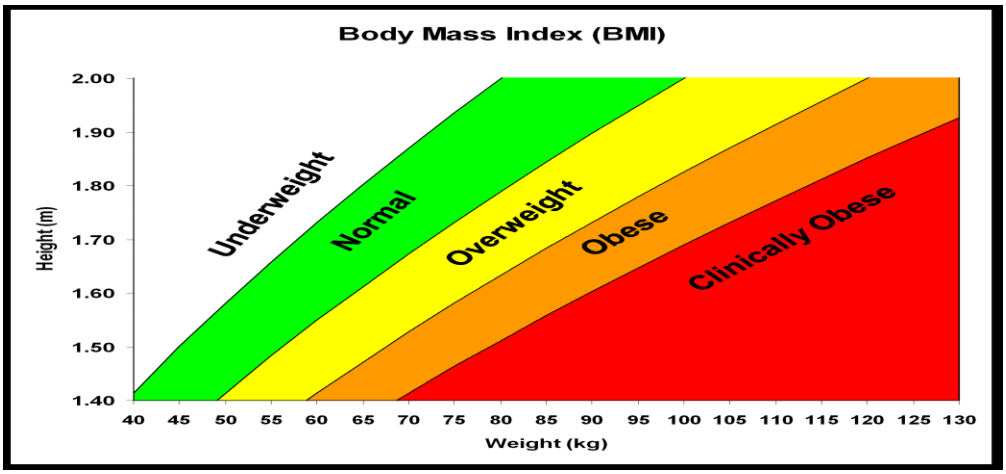


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Figure 3. Body max index chart

2.4.2. Waist measurement

Waist circumference is a simple check to t carrying excess body fat around middle. Waist circumference is positively correlated with abdominal fat content. Carrying excess body fat around middle is more of a health risk than if weight is on hips and thighs. Regardless of height, for most adults a waist measurement of greater than 94 cm for men and 80 cm for women is an indicator of the level of internal fat deposits which coat the heart, kidneys, liver, digestive organs and pancreas. This can increase the risk of heart disease and stroke Waist measurement helps to

assess risk by measuring the amount of fat carried around middle. It provides a clinically acceptable measurement for assessing a patient's abdominal fat content before and during weight loss treatment. (NHLBI,1998)

2.4.3. Skin Fold Measurement

The most widely used method for determine body fat percent calipers of a double fold of skin at various sites .when considering validity, reliability, economy, and good norms skin fold tests are probably most practical and useful with proper training and practice testers can learn to assess body composition quickly accurately. Howe ever, careful selection and observation of rules for measuring are important.(Leigh.Ph, 2010)

2.4.4. Under Water Weighing

Method of determine body composition by weighing the individual under water. In this procedure whole body density is calculated from body volume and then body density is converted to percent body fat through use of equations (Leigh.Ph,2010).

2.4.5. DEXA

the acronym for dual energy x-ray absorptiom–etrry ,which is a method for estimating body composition .it uses allow radiation does to measure bone minerals , fat mass ,non bone fat free mass (a three component model) (Leigh.Ph,2010).

2.5. Classification of Body Weight

2.5.1. Optimal Body Weight

The healthiest body weight taking account fat-free mass and fat mass. Calculated by dividing the fat –free mass by 100%desired percent body fat.

2.5.2. Under Weight

Underweight is a term describing a person whose body weight is considered too low to be healthy. The definition usually refers to people with a body mass index (BMI) of under 18.5or a weight 15% to 20% below that normal for their age and height group.

2.5.3. Defining Excess Weight

In reviewing weight issues and potential interventions, it is important to first define excess weight. In adults, there is general consensus that excess weight is measured using standard categories of Body Mass Index (BMI). BMI is a direct calculation using height and weight, and is a practical indicator for adults of body fat. In the U.S., adults whose BMI measures 25.0-29.9 kg/m² are categorized as overweight, 30.0-34.9 kg/m² as mildly obese, 35.0-39.9 kg/m² as moderately obese, and >40.0 kg/m² as extremely obese (NASMHP,2008)

2.6. Types of Obesity

In general obesity can be categorized as upper truncal obesity and lower truncal obesity also known as 'apple type of obesity' and 'pear type of obesity', respectively. (vague j.1956) The third type besides android and gynoid, there is one more type of obesity On the basis of distribution of excess body fat obesity is broadly divided into following three categories.(Krichengast *et,*al 1997)

2.6.1. Android (apple type)

Android type of obesity is likened to the shape of an apple. The shoulders, face, arms, neck, chest and upper portion of the abdomen are bloated. The stomach gives a stiff appearance. So, also arms, shoulders and breast. The back seems to be erect but the neck is compressed and there will be protruding chest because of the bulk in the stomach. The lower portion of the body, the hips, thighs and legs are thinner beyond proportion in comparison with the upper part. In these persons, the vital organs affected will be mostly the heart, liver, kidneys and lungs. Though this type of obesity is found more in males it is common in females too. Those females, who are under hormone treatment for their menstrual abnormalities or after childbirth, are more prone to this type of obesity. It occurs in females around menopause too due to thyroid glands functional disturbance. Android type of obesity is a major risk for heart damage and heart disease due to high cholesterol.(Krichengast *et,* al1997)

2.6.2. Gynoid (pear type)

In this type the lower part of the body has the extra flesh. This type of obesity is also common to both sexes though females are more affected. Gynoid type of obesity is similar to pears. The flesh is somewhat flabby in the abdomen, thighs, buttocks and legs. The face and neck mostly

give a normal appearance. In some persons, the cheeks may be drawn too. As these persons grow old, the whole figure assumes a stooping posture and the spine is never erect due to the heavy hips and thighs. The vital organs affected mostly are the kidneys, uterus, intestines, bladder and bowls. In this type of obesity, exercises or dieting will not help appreciably in reducing weight. (krichengast *et,* al1997)

2.6.3. The Third Type

Besides android and gynoid, there is one more type of obesity. Some people do not belong to any of the above type of obesity. Their whole body from head to toe looks like a barrel. Their gait is more like rolling rather than walking. The fat tissues in their body hinder the movement of all the internal organs and consequently affect their brisk functioning. For them any exercise is difficult due to the enormous size of the body. So such persons should follow a strict diet and do plenty of exercise. Obesity and overweight are best defined using the body mass index (BMI). This index is determined by dividing body weight in kilograms by the square of the height in meters: BMI = W/H2. The normal rate for BMI is 18.5-25. A BMI between 25 and 30 kg/m2 is defined as overweight and a BMI above 30 kg/m2 is defined as obesity. Visceral fat can be used as an index of central adiposity. An increase in visceral fat reflects central obesity and increases health risks. The waist circumference (WC) is used to assess the amount of visceral obesity. A WC in men 94 cm or more, and in women 80 cm or more, is the threshold for high health risk but desirable abdominal girth level should be <80 cm. (krichengast *et,* al1997)

2.7. Determinant Factors of Body Weight

Over weight and obesity is multi factorial. The major cause of overweight and obesity are genetics, metabolic rate, eating patterns, lifestyle, and environment as well as other factors described as follows.

2.7.1. Genetics

The term “genetics” refers to the molecular codes that exist in all human beings. Genes are expressed to carry out a variety of functions throughout the body. Research is emerging on how gene expression can be altered by factors outside of the body (epigenetic). For example, a woman’s nutritional habits in pregnancy may be able to alter the genes expressed in her fetus. Some studies show that children who have parents who are obese or overweight are at a higher risk of becoming obese or overweight themselves, even if they are not living in the same home.

Some genes have been identified that may affect appetite or metabolic rate.6-8 these genes exist in various combinations in humans because they probably offered survival advantage. During periods of food availability, these genes may have increased the efficiency of fat deposition so an individual can survive longer during periods of food insecurity.

The interplay between genetics and environmental causes for overweight and obesity can be confusing. Families may share genetics and behaviors. Despite the presence of some genetic factors, it is unlikely that genetics are responsible for the obesity epidemic, which correlates with changing lifestyle patterns. Genetics take generations to change (although changes in gene expression are being studied). Even for those who feel they are genetically predisposed; genes do not supersede all other factors in terms of achieving a healthier weight.

Genetics play a role in obesity and overweight, though the extent which genetics affects weight is still unclear. Five genetic mutations that cause human obesity have been identified, as well as additional genetic risk factors (Challis et al., 2000). Predisposition to obesity appears to be caused by an interaction between at least 250 obesity-associated genes and prenatal factors (Ebberling, Pawlak, & Ludwig, 2002). Overall, although genetic markers have been associated with obesity, genetic causes account for less than 5% of obese individuals (Speiseret al., 2005).Impaired brain function may also contribute to difficulties with weight management. Signaling pathways in the brain tell the body when to eat and when to stop eating (Zheng, Lenard, Shin, &Berthoud, 2009). Even the slightest chemical imbalance in the brain can disrupt healthy signaling and result in significant weight gain. For example, the hormone leptin regulates energy intake and energy expenditure by telling the brain when the body has reached satiation. Defects in the receptor for leptin produces severe obesity syndrome. Also persons prescribed medications which after station signal path ways .often leading to weight gain.

2.7.2. Metabolic Rate

Apart from genetics, people's metabolic rates are largely determined by how active they are. We are told that for every ten years beyond our early to mid-twenties our metabolism slows about 10%. While a reduction in metabolism is observable as we age, such a reduction may be more due to a sedentary lifestyle than to mere aging. Muscle tissue is metabolically active compared to fat, and thus our metabolic level at any moment is in large part due to the state of our muscle

mass. Inactivity accelerates loss of muscle tissue over time which decreases metabolism, making it all but certain that weight will be gained. Activity, on the other hand, reduces muscle loss, or even increases muscle mass, with the effect of increasing metabolism and making it easier to lose weight.(https://en.wikipedia.org/)

2.7.3. Eating Patterns

People's food related habits and cultural expectations are also important determinants of their weight, influencing the types and amounts of foods consumed. For instance, families favoring high-fat, high calorie food (such as lasagna) served 'family style' (so that anyone can take as much as they like) are at greater risk for eating too much food and gaining weight than are families serving smaller portions of lean meats, steamed vegetables and brown rice. Similarly, families who push members to eat, or who keep high fat snacks and deserts handy are at greater risk for weight problems than are families that promote sensible portion sizes and save treats for special occasions. The speed at which people learn to eat and the consciousness with which they do so are important too. People who eat quickly tend to eat more than people who eat slowly as it takes a few minutes for your stomach to tell your brain it is full. Fast eaters sometimes finish their plates before getting the stomach's fullness message.(Ynsheng Ma,*etal* 2003)

2.7.4. Life Style

A sedentary lifestyle is a type of lifestyle with no or irregular physical activity. A person who lives a sedentary lifestyle may colloquially be known as a couch potato. It is commonly found in both the developed and developing world. Sedentary activities include sitting, reading, socializing, watching television, playing video games, and computer use for much of the day with little or no vigorous physical exercise. A sedentary lifestyle can contribute to many preventable causes of death. Screen time is the amount of time a person spends watching a screen such as a television, computer monitor, or mobile device. Excessive screen time is linked to negative health consequences. Physical inactivity a leading cause of disease and disability, warns WHO.

Physical inactivity can have serious implications for people’s health, said the World Health Organization on the occasion of World Health Day in 2002. Approximately 2 million deaths per

year are attributed to physical inactivity, prompting WHO to issue a warning that a sedentary lifestyle could very well be among the 10 leading causes of death and disability in the world.

Sedentary lifestyles increase all causes of mortality, double the risk of cardiovascular diseases, diabetes, asnd obesity, and increase the risks of colon cancer, high blood pressure, osteoporosis, lipid disorders, depression and anxiety. According to WHO, 60 to 85% of people in the world from both developed and developing countries lead sedentary lifestyles, making it one of the more serious yet insufficiently addressed public health problems of our time. It is estimated that nearly two-thirds of children are also insufficiently active, with serious implications for their future health.

Physical inactivity, along increasing tobacco use and poor diet and nutrition, are increasingly becoming part of today's lifestyle leading to the rapid rise of diseases such as cardiovascular diseases, diabetes, or obesity. (WHO)

2.7.5. Environment

The environment is a major determinant of overweight and obesity. Environmental influences on overweight and obesity are primarily related to food intake and physical activity behaviors In countries like the United States, there is an overall abundance of palatable, calorie-dense food. In addition, aggressive and sophisticated food marketing in the mass media, supermarkets, and restaurants, and the large portions of food served outside the home, promote high calorie consumption. Many of our socio cultural traditions promote overeating and the preferential consumption of high calorie foods.

For many people, even when caloric intake not above the recommended level, the number of calories expended in physical activity is insufficient to offset consumption. Mechanization limits the necessity of physical activity required to function in society. Many people are entrenched in sedentary daily routines consisting of sitting at work, sitting in traffic, and sitting in front of a television or a computer monitor for most of their waking hours (NIH,1998)

2.7.6. Other Factors

Medications; Medications associated with weight gain include certain antidepressants (medications used in treating depression), anticonvulsants (medications used in controlling seizures such as carbamazepine [valproiacid, carbazepine , Equetro, Carbatrol] and valproate

[Depacon, Depakene]), some diabetes medications (medications used in lowering blood sugar such as insulin, sulfonylureas, and thiazolidinediones), certain hormones such as oral contraceptives, and most corticosteroids such as prednisone. Weight gain may also be seen with some high blood pressure medications and antihistamines. The reason for the weight gain with the medications differs for each medication. If this is a concern for you, you should discuss your medications with your physician rather than discontinuing the medication, as this could have serious effects.

Psychological factors for some people, emotions influence eating habits. Many people eat excessively in response to emotions such as boredom, sadness, stress, or anger. While most overweight people have no more psychological disturbances than normal weight people, about 30% of the people who seek treatment for serious weight problems have difficulties with binge eating.(Kolsa Km,et,al 2010)

Diseases such as hypothyroidism, insulin resistance, polycystic ovary syndrome, and Cushing's syndrome are also contributors to obesity.

Social issues: A link between social issues and obesity has been established. Lack of money to purchase healthy foods or lack of safe places to walk or exercise can increase the risk of obesity. http://www.medicinenet.com/obesity_weight_loss/page3.htm

2.8. Consequences and Risk of Overweight and Obesity

The consequences of obesity can be split into three groups, physical, psychological and social.

2.8.1. Physical

In our looks-obsessed society, lots of people think that being overweight is an appearance issue. But being overweight is actually a medical concern because it can seriously affect a person's health. Excess weight, especially obesity, diminishes almost every aspect of health, from reproductive and respiratory function to memory and mood. Obesity increases the risk of several debilitating, and deadly disease .People who are overweight have an increased risk of:

- ❖ cardiovascular disease
- ❖ High blood pressure
- ❖ Strokes

- ❖ Type 2 diabetes
- ❖ Some cancers

In addition to the above, obesity can reduce life expectancy by up to 9 years .Being overweight can also put extra pressure on joints and limbs, making activity quite difficult and sometimes any movement at all can be painful (Institute of Medicine.2012)

2.8.2. Psychological

Many people can also develop psychological problems because of being overweight or obese. For example: low self-esteem; poor self-image (not liking how you look); low confidence; feelings of isolation. These feelings may affect relationships with family members and friends and, if they become severe, may lead to depression. Studies have shown that obesity can lead to psychological problems such as:

- ❖ Depression
- ❖ Anxiety
- ❖ Low quality of life
- ❖ Low self-esteem
- ❖ Body dissatisfaction (Institute of Medicine.2012)

2.8.3. Social

The social consequences of being overweight and obese are serious and pervasive. Some of them are listed below:

- ❖ More likely to suffer from prejudice and discrimination in some situations (for example Employment, travel, schooling, healthcare, retail etc)
- ❖ Fewer friends
- ❖ Lower educational attainment
- ❖ Lower employment
- ❖ less likely to marry more likely to divorce (http://lams.slcusd.org/pages)

2.9 Preventive and Treatment Method of Overweight and Obesity

2.9.1. Exercise

Exercise is an essential component of a healthy weight management program. Where a person's genetics are more or less set at conception, the amount of energy a person expends in physical activity is under voluntary control. People can choose to be more active, and becoming more active will help people to lose weight. Exercise builds lean muscle mass and burns up fat reserves. Muscles are very metabolically active. Adding muscle mass through strength training raises metabolism (the rate at which the body burns calories) which makes it easier to lose weight. A significant loss of muscle mass, on the other hand, which is what happens when people are sedentary, reduces resting metabolic rate and makes it harder to lose weight. Adding muscle mass helps people to look firmer and slimmer because muscle takes up less space than fat. Careful strength training reduces the risk of accidental injury, improves bone density, helps with digestion and assists in lowering blood pressure, cholesterol and triglyceride levels (all predictors of disease when elevated. It is recommended that all adults should aim for 150 minutes of exercise a week. One way to do this is to do 30 minutes of moderate-intensity exercise in bouts of 10 minutes for five days of the week. Another method is to do 75 minutes of vigorous-intensity activity spread throughout the week or a combination of moderate and vigorous activity. It is estimated that just to stay the same weight, if diet is not altered, most people need to do 45-60 minutes of moderately-intensive exercise every single day. (https://www.mentalhelp.net)

2.9.1.1. Aerobic Exercise

Aerobic exercise any activity involving large muscles, done for an extended period of time. Aerobic exercise is done primarily for cardiovascular fitness and weight loss. Aerobic-type training is commonly undertaken to promote weight loss since it can potentially increase energy expenditure with-out changing energy intake (Ballor, 1996) Aerobic exercise is rhythmic activity that can be maintained continuously and employs the body’s largest muscle groups (i.e. the legs).

Aerobic literally means “with oxygen”. The continuous rhythmic nature of aerobic activity drives the heart and lungs to bring fresh oxygen to the working muscles. Since fat only burns when oxygen is present, it is important that some form of aerobic exercise be included in a fat loss program. In addition, aerobic exercise at threshold levels encourages muscle growth as it

builds cardiopulmonary endurance. To be of maximum benefit, aerobic exercise should be performed 3 to 5 times a week for at least 20 minutes per session.(http://www.biodyncorp.com)

2.9.1.2. Circuit Training

Circuit training was developed by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England. It is a scientific arrangement of exercises, performed systematically and repeatedly as circuit. Circuit training is the training method in which certain exercises of various kinds are performed with or without apparatus with given dosage. (A Febin Je, C Robert Al,2016)

The term circuit refers to a number of carefully selected exercises arranged consecutively. Each participant moves from one station to the next with little (15 to 30 seconds) or no rest, performing a 15- to 45-second work about of 8 to 20 repetitions at each station (using a resistance of about 40% to 60% of one-repetition maximum).Circuit training is an excellent way to improve mobility, strength and stamina. The circuit training comprises of 6 to 10 strength exercises that are completed one exercise after the other. Each exercise is performed for a specified number of repetitions or for a set time before moving onto the next exercise. The exercise within each circuit is separated by a short rest period. And each circuit is separated by a longer rest period. The total number of circuit performed during a training session may vary from two to six depending on training athletes' level (beginners intermediate or advanced) athletes' period of training (preparation or competition) and athletes' training objectives (Klika *et al*., 2013).

2.9.2. Energy Balance

Body weight is dependent on the first and second laws of thermodynamics. Weight gain is inevitable when total energy intake exceeds total energy expenditure. Contrariwise, when total energy expenditure exceeds total energy intake, body weight will decrease. Thus, the energy balance equation (i.e., weight change = energy intake minus energy expenditure) governs to change in weight (Basllor, 1996)

If there is a positive energy balance, with intake greater than expenditure, there will be a gain in body weight. Conversely, when energy expenditure is in excess of energy intake, body weight will become less. It is interesting to examine the actual amounts of energy represented by these weight changes. The weight which is added or lost from the body does not consist only of fat

itself but is mostly adipose tissue which is a complex mixture of fat (lipid), connective tissue, and fluid. One kilogram of lipid has an energy equivalent of about 9000 kcal. The energy content of the connective tissue and fluid is comparatively low, but these form 10–30% of the total mass of adipose tissue, which therefore has a lower energy equivalent than pure lipid: about 7000 kcal/kg. When the body is losing weight, each kilogram of adipose tissue which is being consumed has therefore provided 7000 kcal of energy. The body energy stores by about 7000 kcal opposite circumstance, when the body is gaining weight, each kilogram of added adipose tissue increases.

An energy imbalance in the body results in a weight gain or loss. There is an energy balance when the caloric intake equals the caloric expenditure. A positive energy balance is created when the input (food intake) exceeds the expenditure (resting metabolism plus activity level). For every 3500 Kcal of excess accumulated, 1Lb (0.45kg) of fat is stored in the body. A negative energy balance is produced when the energy expenditure exceeds the energy input. This can be accomplished by reducing the food intake or increasing the physical activity level. A caloric deficit of approximately 3500 Kcal produces a loss of 1 Lb of fat. Proper nutrition and daily physical activity are key components of a weight management program. The basic principle underlying safe and effective weight loss programs are that weight can be lost only through a negative energy balance, which is produced when the caloric expenditure exceeds the caloric intake. The most effective way of creating a caloric deficit is through a combination of diet (restricting caloric intake and exercise (increasing caloric expenditure) (Heyward, 2002)

2.9.3. Life Style Modification

Expert panels sponsored by both the World Health Organization and the National Institutes of Health have recommended that obese adults (i.e., body mass index ≥30 kg/m2), as well as those who are overweight (body mass index of 25–29.9 kg/m2) and have co morbid conditions, lose 10% of their initial weight. A comprehensive program of lifestyle modification is considered the first option for achieving this goal. Lifestyle modification, also referred to as behavioral weight control, includes primary components: diet, exercise, and behavior therapy. Obesity is mostly preventable through a combination of social changes and personal choices. Weight management strategies should include modification of diet and physical activity, and of daily habits and thoughts. Specific behaviors conducive to overeating or under-activity need to be identified and

corrected. Weight loss is more likely to be achieved and maintained by behavior modification techniques that focus on lifestyle and attitude.(Ashish,M *etal*,2005)

Weight management can be assisted through improved nutrition, physical activity or behavioral change, with a combination of all three being most effective. Where possible, increased physical activity should be adopted, with150-300 minutes of moderate activity, or 75-150 minutes of vigorous activity a week, which has been associated with improved health outcomes, irrespective of weight loss (Powel KE,2011)

3. MATERIALS AND METHODS

Research methodology is the corner stone, which guide our research. This section includes description and justification of chosen methodology and research methods that are implements during study. Hence these common elements such as the study area, source of data, experimental design, sample and sampling techniques inclusive and exclusive criteria, methods and procedures of data collection, method of data analysis present in separate section

3.1. Description of the Study Area

The studies were conduct at Woliso the town was found in 1927. Woliso (also known as Ghion, which is also transliterated "Giyon" which was given by emperor Haile Selassie I and this name was no longer used after the fall of his regime as the town has the original name **Waliso**) is a town and separate woreda in central Ethiopia. Woliso located in the Debub Mirab Shewa Zone of the Oromia region, 114 km southwest of Addis Ababa the capital city of Ethiopia. It has a latitude and longitude of 8°32′N 37°58′E with an elevation of 2063 meters above sea level with annual rainfall of 1200mL and temperature of 18-27 ^{o}c. Waliso is the administrative center of this Zone. Since then the town has passed through different social, economic and political reforms. Now the town of Woliso has area coverage of 2,225.25 hectare and a population 53,000. Ethnically the population is composed of almost every nation and nationalities of Ethiopia, Woliso Currently the town is serving as being the capital city of southwest shoa zone of Oromia region Waliso town four administrative Kebeles. Dej Geresu Duki Comprehensive Secondary School, Ambo University Faculty of Social Science –Waliso Campus and other private institutes and colleges are located in Woliso. In Waliso, there is a natural hot-spring water, which makes the town among one of the leading tourism heritages in Ethiopia. The town has an amazing view from Meja hill- a volcanic mountain, also Tulluu Majaa in Afan Oromo, situated at the center, one can able to view 360 degree. A crater lake, Wonchi, also Wancii in Afan Oromo, the most beautiful lake in Africa, is only 32 kilometers away from Waliso. . The town is well knoswn by kitfo and kocho, which are special and cultural food of the people. The specific area the study takes place woliso stadium on of the former stadium in the town. https://www.google.com.et/.Map of Study is indicated on page 60.

3.2. Source of Data

In this study, primary data and secondary data source would be taking according to the nature of the problem. The primary data were obtain from anthropometric measurements pre, during, posttest .The secondary data were obtained from various source such as different, books, journals and internet.

3.3. Experimental Design

This experimental quantitative design used for this study was pre, during and post test random group design involving 40 subjects group male volunteer with the age of 22-35 years old who were divide at randomly in two groups twenty of each. Study consists of one TG and CG (no intervention). The subjects selected from Woliso health club participants by using physical activity readiness questionnaires. The pre, during and post tests on selected anthropometric measurement such as BMI, waist circumference, waist hip ratio generally body Compositions test result were administered for selected subject. TheTG participant were engaged in designed Program of twelve weeks aerobic exercise and circuit training(AECT) such as rope jumping, jogging, jumping jack, mountain climber, including warming up ,stretching and cooling down exercise with moderate Intensity, for three days per week (Monday and Wednesday, Friday), for 45-60 minute per day . The control group did not participate in any specialized program during the period of study.

3.4. Sample and Sampling Techniques

The Purposive sampling method was use to select the sample with pre-determined criteria of the study. Based on parameters the subjects among Woliso Town health club participants selected 40 overweight volunteers by using prepared physical activity readiness questionnaires (PARQ).

The subjects were overweight aged 20–35 years, who had body fat>25%. They did not exercise e regularly, and had not been previously diagnosed hypertension, diabetes other health problems. Total sample size consisting of 40 subjects to factor in the subjects who would be dropped from the analysis. The subjects were randomly classifieds into 2groups: treatment (n = 20) and control (n = 20) groups. The subjects were instruct to follow, training program from initial to the end. However, two subjects from the exercise group (TG) were excluding because of health problem and two from the control group were exclude because did not participate in the test conducted at during and post test of the study due to personal case. Thus, 18 subjects from the exercise group and 18 from the control group completed the pre- and post-study assessments.

3.5. Inclusive and Exclusive Criteria

The health statuses of the subject were asses by physical activity readiness questionnaire the subjects who were free from any impairment or disability and chronic disease were included for the study subjects who could not fulfill these criteria were exclude from the study.

3.6. Instrumentation

The following material were used through the study calibrated balance beam scale the total body weight and height, flexible tape meters to measure waist and hip circumferences skin fold calipers to measure the amount of that under the skin other equipment such as stop watch ,whistle, first aid kit.

3.7. Methods and Procedures of Data Collection

Based on the objectives of the research, the physical activity readiness questionnaire (PARQ) distributing for Woliso town willing health club members .then filter 40 from total population by considering (PARQ) as an inclusion and exclusion criteria. Selected subject were at the age of 22-35 and they were actively participates in aerobics exercise and circuit training health related exercise training program which result losing weight for three months (12weeks) and 45-60 minutes per session .Anthropometric measurement pre, during, posttest seriously administered.

3.8. Experimental Measurements

The experimental test measurements consisted body height, weight, waist circumference, hip circumference, waist to hip ratio, BMI test were taken before training program in terms of pretest ,during training test and finally after 12 weeks of training or Post training.

3.8.1. Height Measurement

The calibrated height and weight digital balance beam scale in meters was used to measure the total body height participant were asked to stand was barefooted.

3.8.2. Body Weight Measurement

This is measurement take total body mass of an individual the calibrated digital balanced beam scale in kilogram (kg).subjects weighted in light clothing with bare footed. Strictly speaking, body weight is the measurement of weight without items located on the person, without shoes or heavy accessories such as mobile phones and wallets.

3.8.3. Body mass index (BMI)

This measurement was taken properly to calculate the percentage of total body weight and ratio .it is indirect measurement of body fat and can be calculated as subject weight in kg divided by the square of height in meters .(ACSM ,2010)

$$BMI = \frac{\text{Weight (kg)}}{\text{Height squared (m2)}}$$

3.8.4. Waist Circumference (WC)

When waist circumference test was taken the subject was asked to stand cloths. The waist circumference is measuring at the level midway between the lower rib margin and the iliac crest with the participation breathing out gently. This technique is using to measure the fat accumulation around the abdomen using flexible tape meters and the unit of measurement is in centimeters (cm). (ACSM, 2010)

3.8.5. Hip Circumference (HC)

Hip measurements were use to measure maximum circumference over the buttocks by using flexible tape meter and the unit of measurement is centimeter. (ACSM, 2010)

3.8.6. Waist Hip Ratio (WHR)

Waist-hip ratio, or WHR, looks at the ratio of waist circumference to hip circumference. This tests by take the above waist circumference and hip circumference results calculating waist circumference divided by hip circumference.(ACSM,2010)

$$WHR = \frac{\text{Waist circumference (cm)}}{\text{Hip circumference (cm)}}$$

3.9. Mixed Exercise Protocol

This exercise protocol comprised of both aerobic as well as circuit training. The aerobic and the circuit training were using combine during the twelve weeks period. By combined, it was meaning aerobic exercise with body Wight circuit training would give in every session. Frequency of exercise program was keeping three days/week. The subjects performed warm up and cool down exercises in the same manner as described for other exercise program.

3.10. Method of Data Analysis

The data collected through tests was analyze interpreted and tabulated into a meaningful idea using manually and in a computer in order to evaluate the changes observed among participants

that underwent the physical trainings. Data analyzing using computerized statistical package software (SPSS). The paired T-test will used to compare the pre training and post training data and the level of significance <0.05%.

3.11. Ethical Consideration

This study went in line with ethical issues. The privacy of the participant could be protecting. Generally, this research has been conduct as pre rules, policies and research ethics of Haramaya University.

4. RESULTS AND DISCUSIONS

The chapters deals with the result and discussions of the study .The purpose of this study was to investigate the effects of aerobic exercises combined with circuit training on body weight management among participants of woliso town health club. In this study 40 male recruited as Subjects. They were divided randomly into two groups equal in number exercise group (n=20) and control group (n=20) out of 40 subjects 2 subjects from TG 2 subjects from CG with draw training only 36 were able to accomplish the study .The first group (Treatment group) included 20 males treated with AECT 12 weeks. The second group (control group) included 20 males no treatment was given. The test measurement used to collect the results were body weight, body mass index, waist circumference, hip circumference, waist to hip ratio. In this study, the test had been taken three times pre, during, post. Data was analyzed by using SPSS statistical package software (version 16.0). The results of those variables are discuses as follows.

4.1. Body Weight (kg)

Table 3. The mean values of body weight for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period

	PARAMEER			
	BW			
	TG(n=18)		CG(n=18)	
Tests	Mean ± SD	Sig	Mean ± SD	Sig
PR	89.6±3.47	.000	88.9±2.85	.015
DT	88.3±3.42	.000	88.3±2.90	.202
PoT	86.2±3.39	.000	88.4±2.93	.012

BW=body weight, TG=treatment group, CG=control group, PR=pretest, DT= during test, PoT=posttest, values are mean ± SD

Table 3 indicates that there were significant changes in the reduction of body weight in treatment group .body weight reduced pre test from 89.6 to posttest 88.3 kg (3.8%,P<.0.05) .

Similarly, table also indicated that body weights no significant changes from among CG Participants.

The data showed there is change of body weight in-group of AECT participants' given relatively compare with CG .the use of the physical exercise has been one of the most employed procedures for the overweight obesity treatment. There is a significant inverse relation between physical activity and body fat.

Studies have verified the effectiveness of the exercise for the increase on the fat burn and decrease on the body weight the results are also in line with the previous literature that found improvements in health related Parameters of overweight participants as a result of regular exercise participation (Leslie H.*et, al* 2012).

4.2. BMI (Kg/m^2)

Table 4. The mean values of body BMI for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period.

	PARAMEER			
	BMI			
	TG(n=18)		CG(n=18)	
Tests	Mean ± SD	Sig	Mean ± SD	Sig
PR	26.16±0.40	.000	25.96±0.53	.014
DT	25.79±0.47	.000	26.08±0.57	.985
PoT	25.19± 0.54	.000	26.08±0.55	.025

BMI=body max index, TG=treatment group, CG=control group, PR=pretest, DT= during test, PoT=posttest, values are mean ± SD

Body mass index (BMI) is an index of weight-for-height that is commonly used to classify overweight and obesity in adults The data showed that there were significant changes the reduction of BMI in TG of participants. This was due to the training they were engaged in the AECT. The mean value of BMI reduced from 26.16 kg/m^2 to 25.19 kg/m^2 (3.7%, P,<.0.05) for TG recorded. However, table indicated that there was no reduction from among CG but

additional BMI gain due to no action taken in order to manage their body weight within twelve weeks experimental period. Similarly, recent study clearly shows that exercise increases the total energy needs, thus forcing the body to remove fat from the fat deposit to supply the additional energy and causing loss of weight.(Maughen Rj,1993)

4.3. Waist Circumference (WC)

Table 5. The mean values of WC for TG and CG involved in aerobic exercise combined with circuit training for twelve weeks of experimental period

	PARAMEER			
	WC			
	TG(n=18)		CG(n=18)	
Tests	Mean ± SD	Sig	Mean ± SD	Sig
PR	104.39±2.76	.000	103.94±2.87	.029
DR	101.22±2.12	.000	104.28±2.67	.331
PoT	96.72±1.93	.000	104.33±2.70	.030

WC=Waist circumference, TG=treatment group, CG=control group, PR=pretest, DT= during test, PoT=posttest, values are mean ± SD

The data indicated table that the waist circumferences of treatment group were progressively changed from pre test to post test of experimental period. The TG waist circumference mean value was reduced from 104.39 pretest core to 96.72 (7.3%,P<.0.05) posttest. Research result are revealed the improvement WC due to AECT intervention with in 3month experimental period .However,>95cmWC for men indicate the risk level. No significance change showed among CG participants. Many research shows waist circumference is an indicator of regional body fat distribution on around the abdomen (also called central obesity) believed to be a better predictor of weight-related diseases like adult-onset diabetes, abnormal cholesterol levels, high blood pressure, gallstones, stroke, peripheral vascular diseases and heart attack. Excess abdominal fat is also associated with increased risk of breast cancer, problems with ovulation and obstructive

sleep apnea. On the other hand, Waist circumference is a guide to determining whether you are a higher-risk apple-shape, or a lower-risk pear-shape. People, who are shaped like apples, carrying excess weight in the abdomen, are more likely to have diabetes and heart disease than are those built like pears, who deposit fat in their hips, thighs and backsides." This was even further emphasized study by (SKlein et al, 2004).

4.4. Hip Circumference (HC)

Table 6. The mean values of body HC for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period

	PARAMEER			
	HC			
	TG(n=18)		CG(n=18)	
Tests	Mean ± SD	Sig	Mean ± SD	Sig
PR	01.83±2.43	.000	101.50±2.85	.163
DR	100.56±1.9	.000	101.61±2.81	.331
PoT	99.44±1.72	.000	101.56±2.79	.331

HC=Hip circumference, TG=treatment group, CG=control group, PR=pretest, DT= during test, PoT=posttest, values are mean ± SD

The data in table 5 revealed that the mean value of hip circumference in TG was changed from 101.83 to 99.44 (2.3%, $P<0.05$) the TG decreased at the end of the experimental period. As table shows the CG hip circumferences the pre test to post test result was the same throughout the study period this means there is no significance change.

Considering hip and waist simultaneously, the strength of the inverse association for large hips generally exceeded the positive association for waist.(lauren,Li,2001) According to Seidell ,JC,*et,al*2001 finding has shown that HC and WC have independent and opposite effects on health risk. Whereas WC is positively associated with health risk, HC are negatively associated with health risk. This implies a protective effect of a large hip circumference, which could be due

to a greater lean mass in the nonabdominal regions Moreover, further research is needed to understand the effects of aerobic exercises combined with circuit training in detail and to struggle obesity in adults.

4.5. Waist Hip Ratio (WHR)

Table 7 . The mean values of body WHR for TG and CG involved in aerobic exercise combined with circuit training for twelve week of experimental period.

	PARAMETR			
	WHR			
	TG(n=18)		CG(n=18)	
Tests	Mean ± SD	sigTG	Mean ± SD	Sig
PT	1.02±0.01	.000	1.01±0.01	.042
DR	1.00±0.01	.000	1.02±0.01	.331
PoT	0.96±0.01	.000	1.02±0.01	.020

W/H=Waist hip ratio, TG=treatment group, CG=control group, PR=pretest, DT= during test, PoT=posttest, values are mean ± SD

As indicated in table 5 (W/H) the mean value of TG waist hip ratios before training (pretest) was 1.02 and after they engaged in AECT the mean value of decreased to 0.96 (6% ,P <.0.05) .The improvement rate of this data was indictor of the effects of AECT.

As indicated table waist to hip ratio mean value of CG pre test result was 1.01 posttests was 1.01. The result showed that the CG was same throughout study .which indicates no significance difference was observed on CG of participants. The result of this study was comparable with the findings of(Mengistu Al *et,al,*2013)A total of 30 (85.7%) adult obese subjects (age45.2±5.4 y; weight 86.8 ± 3.0 kg; BMI 30.4 ± 0.7 kg/m2,) were completed the 12 weeks intervention study. statistically significant changes were observed in all variables from baseline. Anthropometric and body compositions outcomes at the end of the training program, significant ($p<0.001$) reduction from baseline was observed on body weight (6.1%), waist circumference (3.8%) and waist-hip ratio (2.9%), body fat %(11.2%), subcutaneous fat % (8.6%), visceral fat

(10.8%)respectively . further investigation needed for understand the effect of aerobic exercises combined with circuit training on waist to hip ratio.

4.6 .Comparison of Anthropometric Results of BW, BMI, WC.HP, WHR

Table 8. Changes in the Anthropometric measurement characteristics treatment and control groups

	PARAMETER			
	TG =(18)		CG=(18)	
Variables	PR ± SD	PO T±SD	PR ±SD	POT±SD
BW(kg)	89.6±3.47	86.2±3.39	88.9±2.85	88.4±2.93
BMI (kg/m$^{2)}$	26.16±0.40	25.19±0.54	25.96±0.53	26.08±0.55
WC(CM)	104.39±2.76	96.72±1.93	103.94±2.87	104.3±2.7
HC(CM)	101.83±2.43	99.44±1.72	101.50±2.85	101.56±2.7
WHR (%)	1.02±0.01	0.96±0.01	1.01±0.01	1.02±0.01

PR=Pretest, POT=Posttest, BW=Body weight, BMI=Body max index, WC=Waist circumference, HC=Hip circumference, W//H=Waist hip ratio%

The above table showed that TG there was significance difference in between the pre to post test score of all anthropometric measurement was due to AECT in which they were engaged in .the mean score value of BW pre test before training result was (89.6) and post test after training mean score values was (86.2.) The mean value score of pre test with mean score values of 12 weeks AECT mean difference value decreased by (3.6).

As indicated the tables mean value of BMI from pre test 26.16 decreased to 25.19 posttest. BMI score of pre test to post test mea n difference value of TG decreased (0.97) recorded.

The mean value of WC from pre test 104.39 decreased to 96.72 posttest. WC score of pre test post test mean to post test mean difference value of TG decreased (7.6) recorded. The mean value of HC also reduced from pre test 101.83 to 99.44 post tests .HC score of pre test mean to post mean difference value of TG reduced (2.4) recorded. The mean value of waist hip ratio (W/H) from pre test 1.02 decreased to 0.96 posttest. Waist hip ratio/H score of pre test mean to post test mean difference value of decreased (0.06) recorded.

When we compare the pretest and post test of mean difference value score in each parameters of 12 weeks AECT intervention treatment groups. The first Better change observed on W.C=7.3%, second on W/H =6% thireed on BW=3.8%, forth BMI=3.7%, lowest score of mean difference value was HC=2.3% respectively. The improvement rate of this data was one indicator of the great AECT effect on W.C=7.3% than others parameter. Therefore, aerobic exercise combined with circuit training important for reduction of central obesity according to the result on this study.

Since all score of mean difference value had been reduced from pre test to post test it clearly showed that body weight management were progressively well improved from pre training to post training in TG. The result also showed that the CG was the same throughout the study .which indicates no significance difference was observed on CG of participants. This result line with the previous literature Suleen SHo *et,al* (2012) A 12-week training program of resistance or combined exercise at a moderate-intensity for 30-min, five days/week resulted in unique improvements to the overweight and obese participants compared to no exercise. Currently, there are no specific recommendations for the type of exercise the overweight and obese should engage in. the combination of exercise gave greater benefits for weight loss, fat loss and physical fitness than aerobic and resistance training modalities.

Moreover, further research is needed to understand the effects of aerobics exercise combined with circuit training in detail and to alleviate the struggle of obesity.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

The vast majority of scientific evidence supports a beneficial role of exercise on achieving bodyweight stability and overall health. The objective was to find out the ways to maintain healthy body weight through exercises .This was the reason the researcher had selected the aerobics exercise combined with circuit training program for this study. Based on this the study with objectives of investigate the effect of aerobic exercise combined with circuit training on the body weight management among participants of Woliso health club had been and well conducted.

Forty over weighted subjects sex only male their age range from twenty two up to thirty five years and their body max index (BMI) between >25.0kg/m^2-27.kgm/^{2} were participated in this study, purposive sampling was used to select participant. The selected participant were assigned in to two groups TG=(20) and CG=(20) exercise were done for three consecutive months(November, December, January) three days per week 45-60 min for TG only with aerobic exercise combined with circuit training. Pre training, during test were taken and only 36 subjects result analyzed the remain four subjects with draw training period due to different cases.

The training program consisted of moderate intensity (60-65HRMax) including proper warming up , dynamic stretching, cooling down /static stretching performed in each training session .the test measurement used to collect the result were including body eight ,body max index, waist circumference ,hip circumference ,waist hip ratio .

The data was analyzed by SPSS statistical software package version 16.00 paired tests was used to identify or to see the significance between the training program result on the changes of body weight .The level of significance was set at $p<0.05\%$. The statistical results of each t est were analyzed and discussed based on parameters separately.

The result and analysis of the study between the pre and post test data from both groups (TG and CG) clearly showed that there was significance difference in each of the test measurements including body weight, body max index waist circumference hip circumference waist hip ratio. As the study finding indicated that TG with aerobics exercise combined with circuit training

Program had positive effect on body weight management inversely CG participant no significance change observed throughout the study.

5.2 Conclusions

This study answered the initial research questions regard with the effects of aerobic exercises combined with circuit training on body weight management of overweight adults with reference of anthropometric measurement.

Based on the obtained results of the study, the following points are stated as conclusions.

- Almost in all parameters, clearly showed that the better test results were recorded in post training than pre and during training. This indicates that aerobics exercise combined with circuit training program were effective for the reduction of overweight.
- Continuing participating in aerobic exercise combined with circuit training program had the potential to manage healthy weight.
- Aerobic exercise combined with circuit training had great effect on anthropometrics variables (BW,BMI,WC,HC,WHR).
- In general, this finding clearly noted that aerobic exercise combined with circuit training program has significant effect on the body weight management.

5.3 Recommendations

Considering the major findings and conclusions of the study, it is important to write the following recommendations:-

- Develop habits of participation in aerobics combined with circuit training program as parts of life at least three day per week for 30 minute.
- Develop the habit of participation in combined exercise program with well-balanced dietary intake important because to prevent weight regain after substantial weight loss program.
- Some limitation were faced while conducting this research, this due to the absence of gold standard body composition measurement and also diet no part of study , therefore, further findings may be proceed and conducted by fulfilling the above challenges.
- It is highly expected from professional of physical education and sports and related fields to guide and educate on the importance and benefit of aerobic exercise combined with circuit training program on the reduction of body weight. Future research will be needed to give a better insight in to the many issues affecting physical activity levels of people, including the barriers to healthy active living.
- Everyone Take part of active living before being overweight or obsess preventive measurements better.
- In order to maintain optimal weight, finding ways to fight against the modern way of living that drives excess energy intake relative to expenditure
- Peoples who are overweight or obese should be continuing participation levels even if you do not lose weight as a result, because exercise can bring other health benefits such as reduced risk of type 2diabetes and cardiovascular disease.

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7. APPENDIXCES

APPENDIX A

Physical activity readiness questionnaire (PARQ)

This questionnaire is prepared to obtain information on the health status and physical activity readiness Subjects participating for the study. Please read the questions carefully and answer each one honestly by encircling it on the choice letter given and describing your condition in the space provided.

1. Has your ever said that you have heart condition or high blood pressure?

A. Yes B. No

2. Do you feel pain your chest when you do physical activity?

A. Yes B. No

3. Do you lose your balance because of dizziness or do you ever lose consciousness?

A .Yes B. No

4. Do you have bone or joint problem (e.g. ankle, hip, back, shoulder, etc) that could be made worse by a change in your physical activity?

A .Yes B. No

5. Have you ever been diagnosed with another chronic medical condition (other than heart disease of high blood pressure?)

A .Yes B. No

6. Are you taking any prescription medicines recently? If, yes list them below

Name of drug **dosage**

_____

_____

Source; www.eims.org adopted

APPENDIX B

Participant's information sheet and informed consent form

Research Title: Effect of aerobic exercise combined with circuit training on body weight management the case of selected male participant in Woliso town health club south west Shoa ,Ormiya regional state, Ethiopia.

Investigator name: Barnabas Nigus (Bed in physical education minor biology)

1. **purpose of the study**

The purpose of this study to investigate the effect of aerobic exercise combined with body weight circuit training on body weight management on overweight adults. The findings of this study can be very much contribution who are overweight and obese as well as the community in order to combating the problem over weight and obese, next this study is to write research for partial fulfillment of master program in Med.

2. **procedure and duration**

The experiment of the study period will take 3 months .this study will be involves 40 subjects from woliso town health club. Subjects involve in aerobic exercise combined with body weight circuit training under the researcher monitoring.

Training duration in the study will not more than 60 minutes per session .subject also participate in body composition test in three phase at the initial and during and final at the end of 12 week training.

3. **Risk and benefits**

The risk of this study is small. While testing procedure and during session, you may face numbness, muscle soreness. muscle cramp, muscle strain and fatigue but not major injury, in case of you injury or pain the researcher will be provide first aid to you, but not no financial compensation will be given . If it is sever the researcher will be covering every cost for u until rehabilitation period .you feel Pain, abnormal heart rate, to fast or to slow breathing rate, coughing any type of discomfort immediately describe before for risk minimizing.

There may be no personal benefit for participating in this study ,however it is hoped that in the future of study by understanding the effect of aerobic exercise combined body weight circuit

training on body weight management and you will learn how to measure body weight at your home using BMI or waist hip ratio to know your progress .

4. **Confidentiality**

Your test result and other related personal information will kept confidential. Her e will be no information that will identify you in particular. the findings of the study will be general for the study community and will not reflect any thing particular of individual person .the data or test results will be coded to exclude showing names no reference will be made oral or written reports the could link participant s to the research.

5. **Rights**

Participation for this study is fully voluntary .you have the right to with draw from the study at any time and this will not label you for any loss of benefits which you otherwise entitled .but it is not advisable

6. **Contact address.**

If there is any questions or enquires any time about the study or the procedures, please contact;

Barnabas Nigus +251913916344

Email barniystar2007@gmail.com

Dr.shemelis Mekonen (PhD) (Major Advisor) + 251913893850

Email shemelismm@gmail.com

Any problem and complain can be address to institutional research ethics review committee (IRERC) +251566618997.

7. Declaration informed voluntary consent

I read the participant information consent. I have clearly understood the purpose of the research, the procedure the risk and benefits, issues of confidentiality, the right of participating and the contact address for any queries. I will inform that I have the right to withdraw from the study at any time .Therefore I declare my voluntary consent to participate in this study with my signature as indicated as follows.

Participant code no _____ Name of investigator_____

Signature_____ Signature_____

Date_____ Date_____

APPENDIX C

Table 1.Anthropometric Test Record Sheet

Participant code no _____age_____

Sex_____ weight_____

height_____

No	Types of anthropometric test	Units	Major variables to measured	Data collected during experimental period		
				pre test	during test	post test
1	Height	M	Total body height			
2	Weight	Kg	Total body weight			
3	Body mass index	Kg/m^2	Height weight ratio			
4	Waist circumference	Cm	Amount of fat around the abdomen			
5	Hip circumference	Cm	Amount of fat around the hip			
6	Waist to hip ratio	%	Amount of fat in hip and waist			

APPENDIX D

Description of Training Plan

Training plan is a working document and guideline for desired outcomes .however it should be flexible enough to meet the participant need**.** The training plan was outline where and when deliver the training, purpose and goals, equipment need, with considering training principles (FITT).Basically training plan is essential ‘road map ‘ to reach desired destination

The principles of training promote a steady and specific increase in physical ability by specifically adapting a training regime to the needs of a sport, and most importantly, to the individual needs of each trainer. A training program me to minting healthy weight should obey the following principles of training:

Warm-Up

The purpose of the warm-up is to prepare players for the training to follow. During the warm-up, body temperature raised, which is one of the main factors in facilitating performances. The elevation of body temperature warms up and stretches muscles, tendons, ligaments, and other tissues, which prevents or reduces ligament sprains and tendon and muscle strains.

Specificity

The specificity principle asserts that the best way to develop physical fitness is to train the energy systems and muscles as closely as possible to the way that they used in a particular sport. The principle implies that to become better at a particular exercise or skill, they must be performed. To have good stamina, stamina runs must be performed and not short sprints. Training must also be specific to individual abilities such as tolerance to training stress and recoverability. Aerobic exercise combined with circuit training specific exercise for 3-month weight management program under study.

Overload

Whilst training loads must be increased gradually, they must also allow the body to adapt to avoid injury. Varying the type, volume, and intensity of training load allows the body an opportunity to over-compensate and recover. Loading should continue to increase gradually as adaption occurs. When more is demanded, within reason, the body adapts to the increased demand.

Progression

To set daily improve fitness levels, physical demands to overload an athlete's system must continually increase. If the training demand is increased too quickly, players will be unable to adapt and may break down. If the demand is not adequate, they will not reach optimal fitness levels.

Adaption

Adaption refers to the body's ability to adjust to increase or decreased physical demands. Repeatedly practicing a skill or activity makes it second nature and easier to perform. This principle explains why beginning exercisers are often sore after starting a new routine, but after doing the same exercise for a period, they have little, if any, muscle soreness. In addition, adaptation makes an athlete very efficient and allows him to expend less energy doing the same movements. A adaption's to the demands of training occur gradually, over long periods of time and trying to accelerate this process may lead to injury, illness or overtraining.

Cool-Down

A cool-down brings the body back to its normal functions. During a cool-down of 20 minutes, athletes perform activities that facilitate faster regeneration and recovery from strains of training. Players should not leave for showers immediately after the last exercise. Because of training, especially intensive training, athletes build up high amounts of lactic acid and their muscles are Exhausted, tense and rigid. To overcome this fatigue and speed up the recovery process, they should perform stretching exercises. The removal of lactic acid is necessary if the effect of fatigue is to eliminated.

The principles of specificity, progression, overload, adaptation, and reversibility are why practicing frequently & consistently are so important to improve body weight as well as performance. Source :(w.w.w.learning.gaa.ie/player)

Aerobic exercise; Aerobic refers to how body uses oxygen to sufficiently meet energy demands during exercise. That makes sweat, causes to breathe harder, and gets heart beating faster than at rest. It strengthens heart and lungs and trains cardiovascular system to manage and deliver

oxygen more quickly and efficiently throughout body **.**Cardiovascular system is made up of heart and blood vessels e.g., arteries, veins, and capillaries that transports blood throughout the body. Aerobic exercise uses large muscle groups. Every practical session implement according to training principles and keeping safety procedure as well as protocols in order to minimize injury maximizing the benefit from the exercises.

Circuit : a method of physical conditioning in which one moves from one exercises to another, usually in a series of different stations. This workout combines strength training and aerobic/anaerobic training all in one. Various circuits offered including a full body circuit, a lower body circuit, core circuit, upper body circuit, etc. By doing the exercises consecutively, heart rate stays in the aerobic zone, at the same time developing lean muscle tissue. Circuits are great for all levels, beginners up to advanced and burns more calories in less time than a typical strength-training workout. Only body weight exercises are the circuit training component under the investigation, (i.e. no need of equipment) all physical exercises takes place out door.

The exercise protocol comprised of both aerobic as well as circuit training. The aerobic and the circuit training were using combined during the twelve weeks period. Frequency of exercise program is kept three days/week (Monday Wednesday, Friday) at morning time (12:00-1:00 o'clock) gradually increase duration 45 to 60 minute and with moderate intensity (55-69HRmax) .The subjects performed warm up and cool down exercises in the same manner as described for other exercise program.(ACSM,2013)

APPENDIX E

Training Schedule of Three Months

Table 2.First Month (November 2016)

Objective: To create physiological adaptation for physical exercise

days	duration	Types of exercise	1-4weeks				
			Set	Rest b/n set (station)	Minute/exercise Set	Intensity	Frequency
Monday	45	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 2 2 2 2 2 2 2 2 1	1x30s 1x30s 2x30s	1x10 1x10 2x7 1x2 1x2 1x2 1x2 1x2 1x2 1x2 1x9	Moderate (55-69%HRMAX)	3 day week
Wednesday	4 5	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dips Running on the spot plank Cooling down/static stretching	1 1 2 2 2 2 2 2 2 2 1	1x30s 1x30s 2x30s	1x10 1x10 2x7 1x2 1x2 1x2 1x2 1x2 1x2 1x2 1x9	Moderate (55-69%HRMAX)	3 day week
Friday	45	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises lunge Step up Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 2 2 2 2 2 2 2 2 1	1x30s 1x30s 2x30s	1x10 1x10 2x7 1x2 1x2 1x2 1x2 1x2 1x2 1x2 1x9	Moderate (55-69%HRMAX)	

Table 3.Second Month (December,2016)

Objective: To loss of excess fat through physical exercise.

days	duration	Types of exercise	1-4weeks				
			Set	Rest b/n set (station)	Minute/exercise Set	Intensity	Frequency
Monday	50	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 3 3 3 3 3 3 3 3 1	1x30s 1x30s 3x30s	1x10 1x10 3x7 1x3 1x3 1x3 1x3 1x3 1x3 1x3 1x9	Moderate (55-69%HRMAX)	3 day week
Wednesday	50	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises High knees Step up Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 3 3 3 3 3 3 3 3 1	1x30s 1x30s 3x30s	1x10 1x10 3x7 1x3 1x3 1x3 1x3 1x3 1x3 1x3 1x9	Moderate (55-69%HRMAX)	3 day week
Friday	50	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dips on Treble stair Skipping ropes Crunches Cooling down/static stretching	1 1 3 3 3 3 3 3 3 3 1	1x30s 1x30s 3x30s	1x10 1x10 3x7 1x3 1x3 1x3 1x3 1x3 1x3 1x3 1x9	Moderate (55-69%HRMAX)	3 day /week

Table 4. Third Month (January 2017)

Objective: To maintain healthy body weight through physical exercise.

days	duration	Types of exercise	1-4weeks				
			Set	Rest b/n set(station)	Minute /exercise Set	Intensity	frequency
Monday	60	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dipss Skipping ropes Crunches Cooling down/static stretching	1 1 4 4 4 4 4 4 4 4 1	1x30s 1x30s 4x30s	1x10 1x10 4x7 1x4 1x4 1x4 1x4 1x4 1x4 1x4 1x9	Moderate (55-69%HRMAX)	3 day week
Wednesday	60	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Up stair running Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 4 4 4 4 4 4 4 4 1	1x30s 1x30s 4x30s	1x10 1x10 4x7 1x4 1x4 1x4 1x4 1x4 1x4 1x4 1x9	Moderate (55-69%HRMAX)	3 day week
Friday	60	Warming up and dynamic stretching Aerobic exercise/5lap jogging Circuit training(7station)full body Push up Leg raises Mountain climber Step up Triceps dips Skipping ropes Crunches Cooling down/static stretching	1 1 4 4 4 4 4 4 4 4 1	1x30s 1x30s 4x30s	1x10 1x10 4x7 1x4 1x4 1x4 1x4 1x4 1x4 1x4 1x9	Moderate (55-69%HRMAX)	3 day week

APPENDIX F

Anthropometric Measurement Norms

Table 5**. Norms of Waist Hip Ratio**

Sex	Acceptable		Unacceptable		
	Excellent	Good	Average	High	Extreme
Male	<0.85	0.85-0.90	0.90-0.95	0.95-1.00	>1.00
Female	<0.75	0.75-0.80	0.80-0.85	0.85-0.90	>0.90

Source; http://www.topendsports.com/testing/tests

Table 6. **Norms for Waist Circumference in Adults**

	Waist circumference	
Risk category	**Women**	**Men**
Very low	<70cm (27.5in)	<80cm(31.5in)
Low	70.89(28.5-35.0)	80.99(31.5-39.0)
High	90.10(35.5-43.0)	100-120(39.5_47.00)
Very high	>110(43.5)	>120(47.0)

Source; American College of Sport Medicine (20

Table 7. Norms of body max index (BMI)

Classification	**BMI (kg/m2)**	**Sub-classification**		**BMI (kg/m2)**
Underweight	< 18.50	Severe thinness		< 16.00
		Moderate thinness		16.00 - 16.99
		Mild thinness		17.00 - 18.49
normal range	18.5 - 24.99	Normal		18.5 - 24.99
Overweight	≥ 25.00	pre-obese		25.00 - 29.99
		Obese	obese class I	30.00 - 34.99
		(≥ 30.00)	obese class II	35.00 - 39.99
			obese class II	≥ 40.00

Source: American College of Sport Medicine (2010)

APPENDIX G

8.Raw Data of Paired T-Test for Treatment Group

Parameter	Test	Mean	SD	SD.eror	Lower	upper	T	Df	Sing 2-tailed
	PRE	1.3111	.84498	.19916	.89091	1.73131	6.583	17	.000
BW	DUR	2.0722	.82591	.19467	1.66151	2.48294	10.645	17	.000
	POT	3.38333	1.27429	.30035	2.7494	4.01702	11.264	17	.000
	PR	0.37278	0.25651	0.06046	0.24522	0.50034	6.166	17	.000
BMI	DUR	0.60444	0.23833	0.05618	0.48592	0.72296	10.760	17	.000
	POT	0.97722	0.37715	0.08890	0.78967	1.1678	10.993	17	.000
	PR	3.16667	1.24853	0.29428	2.54579	3.78755	10.761	17	.000
WC	DR	4.50000	1.46528	0.34537	3.77133	5.22867	13.029	17	.000
	POT	7.66667	2.30089	0.54233	6.52246	8.8108	14.137	17	.000
	PRE	1.27778	1.07406	0.25316	0.74366	1.81189	5.047	17	.000
HC	DR	1.1111	1.02262	0.24103	0.60257	1.61965	4.610	17	.000
	POT	2.38889	1.46082	0.34432	1.66244	3.11534	6.938	17	.000
	PR	0.01833	0.01043	0.00246	0.01315	0.02352	7.456	17	.000
WHR	DR	0.0356	0.01886	0.00444	0.02618	0.04493	8.00	17	.000

BW= Body weight, BMI= Body max index, WC=west circumference, HC=Hip circumference, WHR=West hip ratio, PR=Pre test, PoT=Post test, WHR=west hip ratio

APPENDIX H

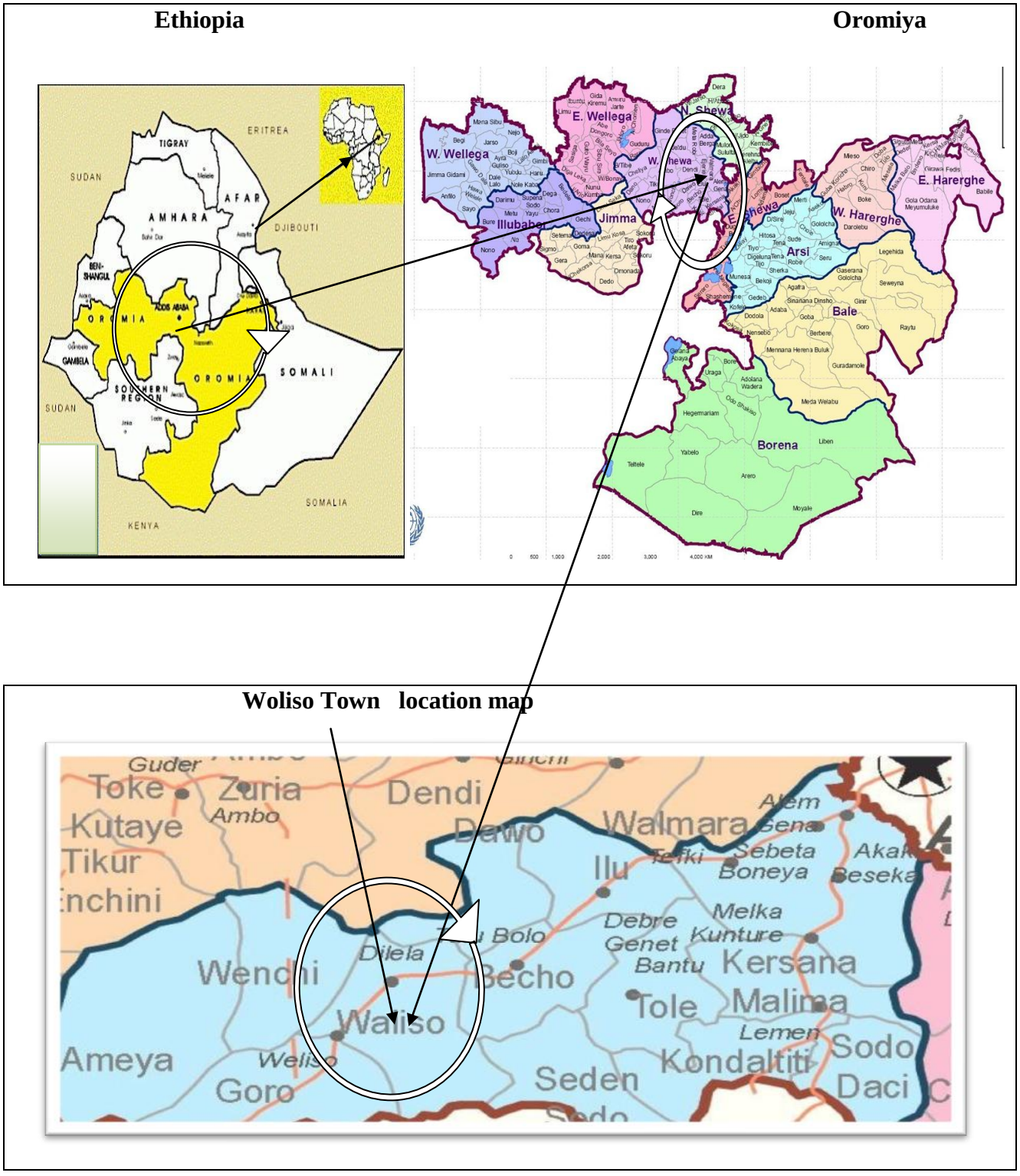
Table 9. Raw Data of paired T-test Control Group

		CG=(18)			95%confidence interval of the difference				
Para meter	T est	Mean	Sd	Sd.eror	Lower	Upper	T	Df	Sing2 tailed
BW	PR	-.42778	-.66845	.15756	-.76019	-.09536	-2.715	17	.015
	DR	-.07778	.24866	.05861	-.20143	.04588	-1.327	17	.202
	POT	-.50556	.76425	.18014	-.88561	-.12550	-2.807	17	.012
BMI	PRT	-.12444	.19373	.04566	-.22079	-.02810	-2.75	17	.014
	DR	-.00056	.12331	.02906	-.06188	.06077	-.019	17	.985
	POT	-.12500	.21495	.05066	-.23189	-.01811	-2.467	17	.025
WC	PR	-.33333	.59409	.14003	-.62877	-.03790	-2.380	17	.029
	DR	-.05556	.23570	.05556	-.17277	.06166	-1.000	17	.331
	POT	-.38889	.69780	.16447	-.73590	-.04188	-2364	17	.030
HC	PR	-.11111	.32338	.07622	-.27192	.04970	-1.488	17	.163
	DR	.05556	.23570	.05556	-.06166	.17277	1.000	17	.331
	POT	-.05556	.23570	.05556	-.17277	.06166	-1.000	17	.331
WHR	PR	-.00222	.00478	.00101	-.00435	-.00009	-2.204	17	.042
	DR	-000556	.002357	.000556	-.001728	-000617	-1.000	17	.331
	POT	-.002778	.004609	.001086	-005070	-.000486	-2.557	17	.020

BW= Body weight, BMI= Body max index, WC=west circumference, HC=Hip circumference, WHR=West hip ratio, PR=Pre test, PoT=Post test, WHR=west hip ratio

List of Figures in the Appendix

Figure1. Map of the Study Site



Source:https://www.google.com.et/search?q=google+map+Ethiopia