



## 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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### 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<sup>2</sup> 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 January 2017. 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 pretest and posttest. The posttest 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 pretest 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.

**Keywords:** aerobic exercise, anthropometric measurement, bodyweight exercise, bodyweight management, circuit training

### Introduction

#### 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) [15].

In 2014, more than 1.9 billion adults 18 years and older over weight of these over 600million 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; ganooids 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) <sup>[15]</sup>. 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.

### 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 woliso 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?

### 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.

### Review of Related Literature

#### 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) [13].

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 gain. 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.

**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) [30]

**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](https://en.wikipedia.org/wiki/Human_body_weight)

**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 mesomorphs or 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>)

**Ectomorphs**

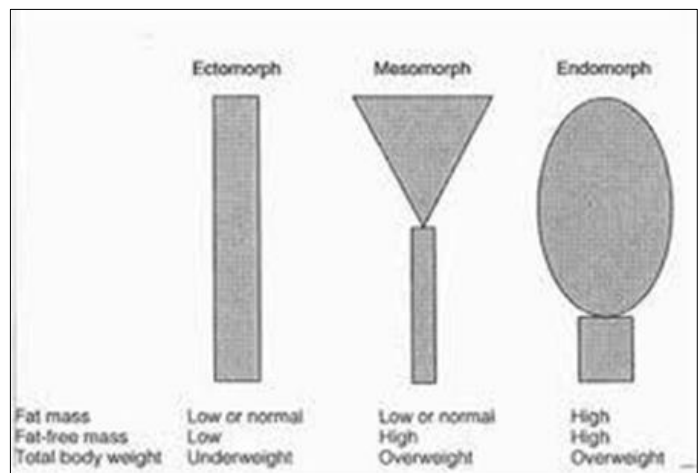
Are generally tall and thin and have long arms and legs. These people have difficulty gaining weight and muscle no matter how much they eat or how hard they weight train. They have the body type tend to see in ballet dancers, runway models, long-distance runners, and some basketball players. A very small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

**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>)

**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>

**Fig 1:** Somatotypes

**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 be 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)

### **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-energy x-ra absorptiom-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 disease 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) <sup>[7]</sup>

### **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)

### **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.

### **Consequences and Risk of Overweight and Obesity**

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

#### **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) <sup>[17]</sup>.



### 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) <sup>[17]</sup>

### 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 attainmen Lower employment Less likely to marry more likely to divorce (<http://lams.slcsd.org/pages>)

### Preventive and Treatment Method of Overweight and Obesity 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>)

### 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) <sup>[4]</sup> 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>)

### 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) <sup>[1]</sup>.

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).

### 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) [15]

### 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  $\geq 30$  kg/m<sup>2</sup>), as well as those who are overweight (body mass index of 25–29.9 kg/m<sup>2</sup>) 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 *et al*, 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, with 150-300 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)

### Materials and Methods

#### Description of the Study Area

The studies were conducted 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 1200mm and temperature of 18-27 °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 Woliso 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 Woliso.. The town is well known 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.

#### 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 obtained from anthropometric measurements pre, during, posttest. The secondary data were obtained from various source such as different, books, journals and internet.

#### Experimental Design

This experimental quantitative design used for this study was pre, during and posttest 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. The TG 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.

#### Sample and Sampling Techniques

The Purposive sampling method was used 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 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 classified into 2 groups: treatment (n = 20) and control (n = 20) groups. The subjects were instructed to follow, training program from initial to the end. However, two subjects from the exercise group (TG) were excluded because of health problem and two from the control group were excluded because they did not participate in the test conducted during and posttest 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.

### **Inclusive and Exclusive Criteria**

The health statuses of the subjects were assessed 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 excluded from the study.

### **Instrumentation**

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

### **Methods and Procedures of Data Collection**

Based on the objectives of the research, the physical activity readiness questionnaire (PARQ) was distributed for Woliso town willing health club members. Then, 40 were filtered from the total population by considering (PARQ) as an inclusion and exclusion criteria. Selected subjects were aged 22-35 and they were actively participating in aerobic exercise and circuit training health related exercise training program which resulted in losing weight for three months (12 weeks) and 45-60 minutes per session. Anthropometric measurements were taken pre, during, and posttest seriously administered.

### **Experimental Measurements**

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

### **Height Measurement**

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

### **Body Weight Measurement**

This measurement takes the total body mass of an individual. The calibrated digital balanced beam scale in kilogram (kg) subjects were weighed in light clothing with bare feet. 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.

### **Body mass index (BMI)**

This measurement was taken properly to calculate the percentage of total body weight and ratio. It is an indirect measurement of body

fat and can be calculated as subject weight in kg divided by the square of height in meters. (ACSM, 2010) <sup>[3]</sup>

$$\text{BMI} = \frac{\text{Weight (kg)}}{\text{Height squared (m}^2\text{)}}$$

### **Waist Circumference (WC)**

When waist circumference test was taken the subject was asked to stand clothed. The waist circumference is measured at the level midway between the lower rib margin and the iliac crest with the participant breathing out gently. This technique is used to measure the fat accumulation around the abdomen using flexible tape meters and the unit of measurement is in centimeters (cm). (ACSM, 2010) <sup>[3]</sup>

### **Hip Circumference (HC)**

Hip measurements were used to measure maximum circumference over the buttocks by using flexible tape meter and the unit of measurement is centimeter. (ACSM, 2010) <sup>[3]</sup>

### **Waist Hip Ratio (WHR)**

Waist-hip ratio, or WHR, looks at the ratio of waist circumference to hip circumference. This test is by taking the above waist circumference and hip circumference results calculating waist circumference divided by hip circumference. (ACSM, 2010) <sup>[3]</sup>

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

### **Mixed Exercise Protocol**

This exercise protocol comprised of both aerobic as well as circuit training. The aerobic and the circuit training were used and combined during the twelve weeks period. By combined, it was meaning aerobic exercise with body weight 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.

### **Method of Data Analysis**

The data collected through tests was analyzed and 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 be used to compare the pre training and post training data and the level of significance <0.05%.

### **Ethical Consideration**

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

### **Results and Discussions**

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 discusses as follows.

**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

**Table 2**

Parameer		
BW		
TG(n=18)		
Tests	Mean ± SD	Sig
PR	89.6±3.47	.000
DT	88.3±3.42	.000
PoT	86.2±3.39	.000

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 pretest 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).

**BMI (Kg/m2)**

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.

**Table 3**

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<sup>2</sup> to 25.19 kg/m<sup>2</sup> (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) [20].

**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.

**Table 4**

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 pretest 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) [10].



## Comparison of Anthropometric Results of BW, BMI, WC,HP, WHR

**Table 5:** Changes in the Anthropometric measurement characteristics treatment and control groups

Variables	Parameter			
	TG =(18)		CG=(18)	
	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 <sup>2</sup> )	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

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 pretest before training result was (89.6) and posttest after training mean score values was (86.2.) The mean value score of pretest with mean score values of 12 weeks AECT mean difference value decreased by (3.6).

As indicated the tables mean value of BMI from pretest 26.16 decreased to 25.19 posttest. BMI score of pretest to posttest mean difference value of TG decreased (0.97) recorded.

The mean value of WC from pretest 104.39 decreased to 96.72 posttest. WC score of pretest posttest mean to posttest mean difference value of TG decreased (7.6) recorded. The mean value of HC also reduced from pretest 101.83 to 99.44 post tests. HC score of pretest mean to post mean difference value of TG reduced (2.4) recorded. The mean value of waist hip ratio (W/H) from pretest 1.02 decreased to 0.96 posttest. Waist hip ratio/H score of pretest mean to posttest mean difference value of decreased (0.06) recorded. When we compare the pretest and posttest 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% thired 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 pretest to posttest 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.

### 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.

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