

**EFFECT OF SELECTED AEROBIC EXERCISES ON
CARDIORESPIRATORY ENDURANCE AND WEIGHT REDUCTION OF
OVERWEIGHT FEMALE STUDENTS OF DILLA UNIVERSITY**

MSc THESIS

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**Effect of Selected Aerobic Exercises on Cardiorespiratory Endurance and
Weight Reduction of Overweight Female Students in case of Dilla University**

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DEDICATION

This thesis is dedicated to my father Demisse Belachew and my mother Alemtsehay Areda.

STATEMENT OF THE AUTHOR

First, I declare that this thesis is my genuine work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Haramaya University and is deposited at the University Library to be made available to borrowers under rules of the Library. I 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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BIOGRAPHICAL SKETCH

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LIST OF ACRONYMS AND ABBREVIATIONS

ACSM	American College of Sport Medicine
ATP	Adenosine tri phosphate
BMI	Body Mass Index
Bpm	Beat per minute
CRE	Cardio Respiratory Endurance
DTT	During Training Test
EHR	Exercise Heart Rate
Gym	Gymnasium
HR max	Maximum Heart Rate
IRERC	Institutional Research Ethics Review Committee
MEED	Microsoft Encarta Encyclopedia Deluxe
PARQ	Prepared Physical Activity Readiness Questionnaire
PoT	Post- Test
PT	Pre-Test
RHR	Resting Heart Rate
SNNPR	South Nations, Nationalities and Peoples Region
SPSS	Statistical Package for Social Sciences
THR	Target Heart Rate
USDHHS	United State Department of Health and Human Service
Vo₂ max	Maximum Volume of Oxygen Uptake
WHR	Waist to Hip Ratio
YMCA	Young Men's Christian Association

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Effect of Selected Aerobic Exercises on Cardiorespiratory Endurance and Weight Reduction of Overweight Female Students in case of Dilla University

ABSTRACT

This study attempted to evaluate effect of selected aerobic exercises on cardiorespiratory endurance and weight reduction of overweight female students in case of Dilla University. Purposive sampling technique was used to select 30 overweight female students of age 19 to 24 years old. All subjects under this study took part in experimental design pre, during and post test from November 2017 to January 2018, 3 days per week for 3 months and 60 minutes per session. The selected aerobic exercises for the study were: walking, jogging, rope jumping, step up and down, step aerobics. Data were analyzed by using SPSS paired samples t- test with pair wise comparison of means at 95% confidence interval by using pre, during and post tests. The results indicated that there were significant improvements in exercise heart rate, resting heart rate, body mass index and waist to hip ratio due to aerobic exercises. This study confirmed that aerobic training was significant to improve the exercise heart rate, resting heart rate, body mass index and waist to hip ratio. The mean difference (MD) between pre and post tests for: exercise heart rate was 3.80000, MD between pre to post for RHR was 3.63333, MD between pre to post for BMI was 1.82533, MD between pre to post for WHR was 0.04533 or before the training their mean values were found in the above average according to the standard and after the training they were included in the average scale due to the aerobic training. The main finding of the study was overweight female students have positive outcomes towards their future career health. Due to aerobic training students achieved both cardiorespiratory endurance and weight reduction.

Key words: Aerobic exercise, body mass index, cardiorespiratory endurance, resting heart rate, waist to hip ratio.

1. INTRODUCTION

The introduction part of this Chapter includes background of the study, statement of the problem, the major research question that was answered after the successful completion of this study, scope of the study, significance of the study and objectives of the study are included.

1.1 Background of the study

It is commonly acknowledged that physical activity and exercise have a positive impact on many aspects of health. Overweight and/or obesity are the problem that most occur on passive individuals due to less expenditure of the energy intake. The body needs a certain amount of energy (calories) from food to sustain basic life functions. Body weight is maintained when calories eaten equals the number of calories the body expends. When more calories are consumed than burned, energy balance is tipped toward weight gain, overweight, and obesity. Genetic, environment, behavior and socioeconomic factors may all lead to overweight and obesity (U.S. Department of Health and Human Services, 2004).

The excess amount of fat in the body has also risk factor on health conditions. Overweight and obesity are risk factors for diabetes, heart disease, high blood pressure and other health problems. Since there is no single cause of all overweight and obesity, there is no single way to prevent or treat overweight and obesity that will help everyone. Most of the time peoples are using exercises, diet, behavioral modification and weight loss drugs. In some cases of extreme obesity, surgery may be recommended (U.S. Department of Health and Human Services, 2010).

Appropriate regular daily physical activity is a major component in preventing chronic disease, along with a healthy diet and not smoking. For individuals, it is a powerful means of preventing chronic diseases; for nations, it can provide a cost effective way of improving public health across the population. Available experience and scientific evidence show that regular physical activity provides people, both male and female, of any conditions including disabilities with a wide range of physical, social and mental health benefits (WHO 2003).

The number of overweight and obese adults has seen a big increase over the past 50 years. Average American adults gain about two pounds per year. Increased weight means a larger number of people with Type 2 diabetes, heart disease, high blood pressure, and stroke. Evidence also links obesity with some cancers. Physical activity engaged in early age can encourage fitness throughout the lifespan. Moreover psychological dynamics associated with seeking and maintaining health, especially in the schools and colleges are most important. The health of students can be more effectively maintained when institutions administrators and experts in physical education collaborate to truly serve the students (Manjappa and Reddy, 2011).

There is general agreement that exercise performed by healthy individuals has both physical and psychological benefits, including improved physical performance and enhanced quality of life (Shangold and Mirkin, 1994). Physical condition is more related to individual's self-image; therefore one of the roots of our relations with others and the feeling we have of ourselves stems from our body posture and physical fitness (Yildirim, 2012). Including protects against known risk factors for cardiovascular disease in men (Blair *et al.*, 1996; Farrell *et al.*, 1998) and women (Blair *et al.*, 1996), provides health benefits into old age (Sui *et al.*, 2007).

Cardiorespiratory fitness is “unquestionably one of the key component of physical fitness, and to some educators it is the single most indicative measure of a person's physical condition” (Johnson and Nelson, 1974). Aerobic fitness is a very good indicator of cardio respiratory fitness/cardiovascular and exercise tolerance for everyday activities that are largely aerobic for the general population (Zuluaga, 1995). Hypokinesia (reduced movement) leads to the development of various chronic illnesses and disorders, as well as an increase in risk factors for the onset of cardiovascular disease (Warburton, Gledhill, and Quinney, 2001; Blair, La Monte and Nichaman, 2004). In addition, physical inactivity is related to other chronic illnesses such as diabetes and osteoporosis (Katzmarzyk, Gledhill, and Shephard, 2000).

1.2 Statement of the Problem

Microsoft Encarta Encyclopedia Deluxe (MEED) (2003) classified exercise into aerobic and anaerobic exercise. Aerobic exercise, which uses oxygen to keep large muscle groups moving continuously at intensity light, moderate and vigorous that, can be maintained for at least 20 minutes. Aerobic exercise uses several major muscle groups throughout the body, results the

greater demands on the cardiovascular and cardio respiratory systems to supply oxygen to the working muscles. Aerobic exercise includes swimming, running, cycling, walking, jogging, and rope jumping and etc are the form recommended for reducing the risk of heart disease and increasing endurance. Thus, aerobic activity generally has a low to moderate intensity and long duration. Oxygen is not present with anaerobic exercise. When we exercise anaerobically glycogen is used as fuel. Once all the glycogen has been depleted (usually in about two hours) you can expect to hit the proverbial wall. Endurance athletes avoid this performance buster with carbo loading before exercise (which when converted to sugar gives more energy) and supplements during exercise to sustain energy (MEED, 2003).

Many research studies show the effect of different exercises for the development of physical fitness. Aerobic exercises are one of important physical activities which are at center of attention in recent years (Yildirim, 2012). Due to this investigator want to investigate the effect of three month regular aerobic exercise training consist of walking, jogging and rope skipping, distance running on selected physical fitness variables such as cardio respiratory fitness, muscular endurance, flexibility and body composition.

Nowadays, physical exercise is a non-pharmacological treatment of modern and busy lifestyle around the globe. Although many studies believe that regular physical activity can have immediate health benefits by positively affecting body composition and musculoskeletal development for males and females. But the reality in our country as well as at Dilla University shows the value of exercise has been known theoretically not more participation practically. Beside this, female participation in physical activity is lower regarding to our country and they are not beneficial from regular physical activity and easily susceptible to many diseases. Thus, this scientific study were provide practical information that can be used by all students how to develop cardio respiratory endurance and reduce weight with simple and easy aerobic exercise training and were evaluate Cardio respiratory endurance and weight reduction for aerobics exercise training by using measurement of step test, resting heart rate, WHR and BMI test. In the past years, the effect of aerobic exercises has been studied regarding their effects on physiological and psychological perspectives in respective manner. The current study concerns on examination of the combined physical and breathing exercises and its potential effect on the cardiorespiratory fitness and weight reduction among Dilla university overweight female

students. The selected aerobic exercises was maintained over 12 weeks. The study tried to answer on the following basic research hypothesis:

H₁ There is relationship between aerobic exercises and Exercise heart rate of overweight female students.

H₀ There is no relationship between aerobic exercises and Exercise Heart Rate of overweight female students.

H₁ There is relationship between aerobic exercise and Resting Heart Rate of overweight female students.

H₀ There is no relationship between aerobic exercise and Resting Heart Rate of overweight female students.

H₁ There is relationship between aerobic exercises and Waist to Hip Ratio of overweight female participants.

H₀ There is no relationship between aerobic exercise and Waist to Hip Ratio of overweight female students.

H₁ There is relationship between aerobic exercises and Body Mass Index of overweight female participants.

H₀ There is no relationship between aerobic exercises and Body Mass Index of overweight female participants.

1.3 Scope of the study

This study was conducted in, Dilla University, Dilla town at SNNP Regional state. This study was employed on aerobic exercise which can improve cardio respiratory endurance and reduce weight. The investigator focuses only female students that they are more exposed to overweight compared to male students. It is difficult to conduct research in all university, due to lack of time and cost. Based on the above reason this study was limited on Dilla University overweight female students.

1.4 Significance of the Study

The main aim of this study was to analyze the relationship between progressive aerobic training and cardio respiratory endurance as well as weight reduction of overweight female students in Dilla University, but it does not mean that the outcome of this research was only restricted to Dilla university; it would also help other university overweight female students to understand the effect of aerobic training exercise in increasing their cardio respiratory endurance as well as reducing weight. In addition, this study was intended to signify the following importance:-

1. It helps to motivate and encourage overweight female students to engage in aerobic training to boost their physical fitness and immunity level.
2. It help for others as a research work for depth studies on the problem undertaken.
3. Enhance investigator ability to conduct further research by providing experience.
4. It offers the opportunity for students to participate in aerobics activities.

1.5 Objectives of the study

1.5.1 General objective

The general objective of this study was to examine the effects of selected aerobic exercise in CRE and reduction of weight of overweight female students in Dilla University.

1.5.2 Specific objectives

- ✚ To examine the effect of selected aerobic exercise on Exercise heart rate of overweight female students
- ✚ To identify the effect of aerobic exercises on Resting heart rate of overweight female students.
- ✚ To investigate the effect of aerobic exercise on waist to hip ratio of overweight female students.
- ✚ To examine the effect of aerobic exercises on BMI of overweight female students.

2. RELATED LITERATURE REVIEW

Related literature review is basic frame work of the study in order to create connected 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. This chapter consist the concept of cardio respiratory endurance, aerobic exercise and its benefits, study's on aerobic exercise, effects of aerobic exercise on cardio respiratory endurance and weight, benefit of cardio respiratory endurance, aerobics exercises to improve Cardio respiratory endurance and reduction of weight, assessment of cardio respiratory endurance and benefits of step aerobic exercise were discussed.

2.1 Physical Activity and Cardio respiratory Fitness

2.1.1 Physical Activity

Caspersen *et al.* (1985) once defined physical activity as “any bodily movement produced by skeletal muscles that results in energy expenditure”. Total energy expenditure can be divided into three components, which include resting metabolic rate, diet-induced thermogenesis and physical activity. Resting metabolic rate accounts for around 70% of total energy expenditure in sedentary individuals, while diet-induced thermogenesis accounts for around 10% (Ravussin and Bogardus, 1992).

Training is often further divided into endurance and resistance training, which enhance aerobic capacity and muscle strength, respectively. Exercise is a subcategory of physical activity. Caspersen *et al.* (1985) defined it as “physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of physical fitness is an objective.” Modern exercise physiology, however, distinguishes between acute and chronic exercise, where acute exercise refers to a single bout of physical activity and chronic exercise to repeated performance of acute exercise. Chronic exercise is also known as habitual physical exercise, physical training or just training (Tipton and Franklin, 2006).

2.1.2 Cardio respiratory Fitness/endurance/

Physical fitness can broadly be defined as the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies (USDHHS, 1996). Cardio respiratory fitness, also sometimes known as cardio respiratory endurance, cardiovascular fitness or aerobic fitness is a health-related component of physical fitness that relates to the ability of the circulatory and respiratory systems to supply oxygen during sustained physical activity (USDHHS, 1996).

Cardiorespiratory endurance is the ability of the heart and lungs to absorb, transport, and utilize oxygen over an extended period of physical exertion. As one of the four primary components of physical fitness, it is an important measure of the overall health and fitness. Age, genetics, and physical conditioning all play a role in an individual's cardio respiratory endurance. A number of biophysical tests, including maximum volume of oxygen consumption ($VO_2\text{max}$) heart rate monitoring, and shuttle run tests are used to measure cardio respiratory endurance. A very fit individual will be able to perform exercise at a greater intensity, over a longer duration, while consuming a smaller volume of oxygen than a less fit person. Regular participation in aerobic activities will usually improve performance on physical tests. It can, more specifically, be defined as the oxygen-forwarding capacity of the cardio respiratory system, either absolute or relative (Holmgren, 1967).

2.2 Aerobic exercise and its benefits

2.2.1 Aerobic exercise

Aerobic exercise is a physical exercise of relatively low intensity that depends primarily on the aerobic energy-generating process. Aerobic means "with oxygen", and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism. Generally light to moderate intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods of time and it refers to exercise that requires the consumption of substantially more oxygen than at rest and can be undertaken for a prolonged duration without excessive fatigue. (<http://www.newllness.com>)

2.2.2 Benefits of aerobic exercise

The benefit of aerobic exercise is myriad. They include systemic changes such as reduced cholesterol and blood pressure, improved muscular endurance, reduced body fat, increased metabolism. Aerobic activities strengthen the heart and lungs, making them more efficient and durable, improving quality and quantity of life. Exercise not only extends the life, but also gives you more energy to live it to the fullest. Aerobic exercise improves the strength of your bones, ligaments and tendons, allows your body to use fats and sugars more efficiently burns lots of calories and plays an important role in reducing the onset and symptoms of aging and illness. Aerobic exercise reduces your risk of heart disease, vascular disease and diabetes and can help those trying to quit smoking by relieving cravings and improving lung function. Research has confirmed that aerobic exercise reduces stress and combats depression as it raises self-esteem and physical and wellness (Kathleen, 2006).

Regular exercise causes your body to make adjustments that result in improved health and physical functioning. Continuing with regular exercise enables your body to maintain these benefits. Regularly doing the right types of aerobic exercise at the correct intensity, and for an appropriate duration, results in the most benefit. The benefit of aerobic exercise can be broadly categorized as either 'fitness' (physical capacity) or 'health'. Fitness and health are linked, and most forms of aerobic exercise will help you achieve both. Regular aerobic exercise improves your cardiovascular fitness by increasing your capacity to use oxygen. Low Impact aerobic exercise such as, swimming is valuable for improving general health and fitness in people who have arthritis or other conditions that limit their ability to do weight bearing exercise. Importantly, whereas fitness tends to be quite specific, many health benefits can be gained from any form of aerobic exercise. Additionally, the health gains can be achieved from relatively moderate of exercise can lead to substantial improvements in health. (Thomas et al. 2008).

Aerobic activities should be used to develop cardio respiratory endurance. Basically aerobic activities are those in which a sufficient amount of oxygen is available to meet the body's demands. During the performance of evaluated level for an extended period, this activity typically involves vigorous and repetitive whole body or large muscle and movements that sustained for an extended period. Popular aerobic activities including running, walking, rowing, swimming, cycling aerobic dancing, jogging, treadmill and somewhat continuous in nature the intensity of work load can be easily regulated by controlling the pace (Shemelis, 2010).

2.3 Studies on aerobic exercise

Selvalakshmi (2007) conducted a study on the effect of varied training programs on obese women working in IT companies for the purpose of the study. For this study, the obese women were grouped into three namely, control, floor aerobic and step aerobics group. The collected data on the cardiorespiratory parameters prior to and after 12 weeks of varied aerobics training were statistically analyzed using analysis of covariance (ANCOVA) as recommended by Clarke (1972) and result on vital capacity showed significant improvement due to varied aerobic exercises, as where no significant improvement was found in resting heart rate.

An increase in aerobic capacity (VO_{2max}), can to a great extent reduce morbidity, both among people who do not have or people who are suffering from cardiovascular disease (Myers, Prakash, Froelicher, Partington, and Atwood, 2002). Thus, the concept of fitness being defined as good condition or good health, tells us that, while we do not expect the general population to compete with athletes, an above average VO_2 max score indicates a healthy level of cardio respiratory fitness and that an individual is fit to cope with the general demands of living (Zuluaga, 1995).

Ozcan and ozturk, 2011 in mugale, turkey conducted the study on the effect of twelve week aerobic exercise program on health related physical fitness components and blood lipids in obese girls. The aim of the study was to investigate the effects of 12 week aerobic program on health related fitness components and blood lipids in obese girls. In this study, a total of 40 girls were recruited as exercise group (n=20) and control group (n=19). Participants joined sessions for 60 min per day, 3 days per week for 12-week. There were significant differences in weight body mass index (BMI), flexibility, sit-ups, hand grip for both hands, skin fold measurements (thigh,

triceps, abdomen, super iliac, sup scapula, chest, body fat percent, heart rate, high density lipoproteins, low density lipoproteins, total cholesterol, and triglyceride between pre-test and post scores in the exercise group ($p < 0.05$). It was concluded that regular aerobic exercise may affect health related fitness components and blood lipids positively in girls.

Selvan and sudha (2008) conducted a study on selected effect of aerobic exercise on selected physiological variables among college girls. For this study aerobic exercise uses large muscle groups rhythmically and continuously and elevates the heart rate and breathing for a sustained period. Common examples includes walking, jogging/running, swimming, rowing, stair climbing, bicycling, cross country skiing, step and dance exercise classes, roller skating, and the more continuous forms of tennis, racquet ball and squash. To achieve this purpose, 60 girls were selected from theivannaiAmmal college for women, Villupuram. The age group of the subjects ranged between 18 to 20 years. The selected subjects were divided into groups.

The groups first trained for aerobic exercise. The training group underwent the training for 5 days in a week for eight weeks and group second acted as control group to make adjustments for differences in the initial means and test the adjusted posttest means for significant differences. The researcher used analysis of covariance for interpreting the results. The results for the study revealed that aerobic exercise had a significant effect in the improvement of the physiological variables such as resting pulse rate, breath holding time, vital capacity and respiratory rate.

A study conducted on the effect of twelve week aerobic exercise program on health related physical fitness components and blood lipids in obese girls by Ozcan and Mehmet (2011) showed a significant decrease 5.73% in resting heart rate.

The result of a study conducted by Odiango et al., (2010) on effect of physical exercise program on health -related fitness components (cardio respiratory endurance, low back flexibility and body composition) of physically challenged pupils also reported similar results reported in this study. The result of the study showed pupils recorded lower heart rate in the posttest as compared to pretest. This was an indication that the physical exercise program was effective in improving subjects resting heart rate.

The problem of obesity and overweight alone is the root cause of many physical problems of human beings. However, the problem of overweight is not the result of only one specific factor; there are many contributing factors for example: physical activities, comfortable lifestyle, dietary habits, genetics, social and psychological attitudes towards life and so on. (Desta. E, 2012).

(Arslan, 2011), Conducted the study on the effects of an eight-week step- aerobic dance exercise program on body composition parameters in middle-aged sedentary obese women in aksaray turkey. This study comprised an eight-week randomized controlled trial. For this study a total of 49 healthy sedentary obese women participated voluntarily. They were randomly divided into two groups; those undertaking a step-aerobic dance exercise program (n=29) and a control group (n=20). The subjects took part in a step-aerobic dance exercise program for one hour per day, three days a week for eight weeks. The subjects Body Mass Index (BMI), weight, waist circumference, waist-hip ratio, four-site skin fold thickness, fat percentage, basal metabolic rate and lean body mass were assessed before and after the completion of the step-aerobic dance exercise program. After the eight weeks of the step-aerobic dance exercise program, significant differences were found in the subjects weight, BMI, body composition parameters, waist-hip ratio (WHR), waist circumference, fat percentage, lean body mass and basal metabolism rate in the group ($p < 0.05$). There were no significant differences in the control group after the experiment in terms of the same measures ($p > 0.05$). The result of this study concluded that the step aerobic dance program proved to be a useful exercise to the eight-week step aerobic dance program in terms of central obesity in sedentary obese Turkish women.

2.4 Anthropometric Changes in Female

Before puberty the variations in the anthropometrical parameters of boys and girls are relatively small, girls regularly have the more adipose tissue than boys. (Siervogel et al., 1991, Jürimäe and Jürimäe, 2001). Puberty starts earlier in girls than boys and is expressed as a quick increase in different anthropometrical parameters (Rolland Cachera, 1995).

2.5 Effect of exercise in reduction waist to hip ratio

There is increasing evidence that central obesity is more strongly correlated with cardiovascular disease than measures of general obesity, such as BMI and body mass. It is important therefore to note that the combined exercise group decreased minimal waist circumference significantly. Perhaps the significant increase in exercise duration for the combined group explains this finding. However, the after training group trended ($P = 0.04$) toward significantly decreased waist circumference by a greater increment. Exercise positively modified the anthropometric parameters of our study groups. We observed decreases in body mass (and thus BMI) as well as in waist and hip circumference. The decrease in waist circumference is especially important to reduce weight. Significant decreases in body mass, BMI, total body fat, total body fat mass, and waist and hip circumference were observed after aerobic training (2015 S. Karger GmbH, Freiburg).

2.6 Assessing cardio respiratory fitness

Monitoring heart rate each time the heart beats, it pumps blood into arteries; this surge of blood causes a pulse that can feel by holding fingers against an artery. Counting pulse to determine exercise heart rate is a key part of most assessment tests for maximal oxygen consumption. Heart rate can also be used to monitor exercise intensity during a workout. The two most common sites for monitoring heart rate are the carotid artery in the neck and the radial artery in the wrist. To take pulse, press index and middle fingers gently on the correct site. Shift position several times to find the best place to feel pulse. (Juul Achten and Asker E. Jeukendrup 2003,)

2.7 Cardio Respiratory Capacity

The cardio-respiratory component of fitness reflects the integrity of the heart and lungs as well as the ability of the muscle cells to use oxygen as fuel. It therefore reflects the degree to which an individual can increase metabolism above resting levels. Incremental tests up to maximal oxygen uptake (VO_{2max}) are used to measure this component and to define the limits of physical work capacity. This measurement is considered to be the best single measure of an individual's overall functional capacity (Shangold and Mirkin, 1994).

2.8 The Effect of Aerobic Exercises on Cardio Respiratory Endurance

Physical training induces a variety of metabolic and physiological changes, which increase aerobic capacity. Aerobic training increases use of fatty acids as oxidative fuel during exercise. This is the consequence of enhanced muscle mitochondrial respiratory capacity, greater blood flow within trained muscle, an increased amount of enzymes mobilizing and metabolizing fat and decreased catecholamine release at a given power output (McArdle *et al.*, 2007).

Cardio respiratory endurance improves with regular participation in aerobic activities, such as speed walking, jogging, cycling, swimming, cross-country skiing, and many others. The term **aerobic** means “with oxygen,” but when applied to exercise, it refers to activities in which oxygen demand can be met continuously during performance.

The physiological changes that result from cardio respiratory training are referred to as the long-term, or chronic, effects of exercise. The effects of training are measurable and predictable (Highered.mcgraw-hill.com, 2013).

2.8.1 Heart Rate

Heart rate a few months of aerobic training lowers the resting heart rate by 10 to 15 beats per minute (bpm). It also lowers the heart rate for a given workload. For example, a slow jog may produce a heart rate of 165 beats per minute before training and 140 beats per minute after a few months of training. The trained heart is a stronger, more efficient pump capable of delivering the required blood and oxygen with fewer beats (Highered.mcgraw-hill.com, 2013).

2.8.2 VO₂max

During aerobic/endurance exercise, as exercise intensity increases, so does VO₂. If someone continues to increase his or her exercise intensity he or she will eventually reach a point of maximal exertion (i.e. he or she cannot work any harder than she or he already is). The VO₂ at this stage of maximal exertion is called maximal oxygen consumption (VO₂max). It is the maximum volume of oxygen that the body is capable of consuming and converting to energy for the working muscles. VO₂max is considered to be the gold standard by which one can measure his or her cardio respiratory fitness level. A person who is fit, in the cardio respiratory sense of

the word "fit," would have a higher VO_2 max than someone who is less fit. However, it is important to understand that, if someone has a larger VO_2 max than someone else, it does not necessarily mean that he or she could beat him or her in, for example, a marathon race. What it means is that the body is more able to absorb and use oxygen to generate energy for muscles, and this will certainly give an edge, but what actually capable of doing with that energy depends on many other factors (the mechanical efficiency with which run at a given speed, for example). (Plowman and Smith, 2003)

2.9 Effect of aerobic exercise to reduce weight

Regular aerobic exercise will produce beneficial effects for any age group providing the exercise is specific and appropriate to the level of fitness of the individual. Progressive exercise correctly performed will increase the level of fitness, reduce weight and improve health. It will also create a sense of well being, produce greater energy and reduce the risk of developing many diseases. Exercise makes demands on the body systems over and above normal every day activities and as result the systems adapt anatomically and physiologically (Rosser, 2001).

With the waist-to-hip ratio, the waist is measured at the narrowest part of the waist, between the lowest rib and iliac crest, and the hip circumference is taken at the widest area of the hips at the greatest protuberance of the buttocks. Then simply divide the waist measurement by the hip measurement. The WHO defines the ratios of >9.0 in men and >8.5 in women as one of the decisive benchmarks for metabolic syndrome. Welborn and Dahlia (2007) and Srikanthan, Seeman, and Karlamangla (2009) confirm, and cite several other investigations that show waist-to-hip ratio being the superior clinical measurement for predicting all cause and cardiovascular disease mortality. Welborn and Dhaliwal add that the hip circumference indicates a lower risk for body fat accumulation, and thus including it into the waist-to-hip equation enhances the accuracy of this measurement technique.

2.10 Structural and Functional Benefits of Cardio respiratory Fitness

There are structural and functional benefits of cardio respiratory fitness:-

- Complete and enjoy daily activities
- Strengthen and increase the efficiency of the heart muscle
- Increase the proportion of high density lipoprotein in the blood
- Increase the capillary network in the blood
- Improve collateral circulation
- Control weight
- Stimulate bone growth
- Cope with stressors
- Ward off infections
- Improve the efficiency of other body systems
- Bolster self-esteem
- Achieve self-directed fitness goals
- Reduce negative dependency behavior
- Sleep better
- Recover more quickly from common illness
- Meet people with similar interests (Daleb and Waynea, 2001)

When doing exercise the muscles are working harder than normal and, as a result, they require more energy than normal. Since the ATP energy used by the muscles is generated with the aid of oxygen, it follows that an increase in exercise intensity will result in an increase in muscular oxygen demands. Therefore, increased exercise intensity ultimately corresponds to an increased VO_2 . This is the reason that breathing gets progressively faster and deeper as exercise intensity increases, the body is trying to provide more oxygen to the working muscles so that they can generate enough ATP energy to keep moving. (Plowman and Smith, 2003).

2.11 Assessment of Cardio respiratory Fitness

Maximal oxygen uptake (VO_2max) is generally accepted as the criterion measure of cardio respiratory fitness. VO_2max is the product of the maximal cardiac output and arterial-venous oxygen difference (ASCM, 2006). The inter-individual variation in VO_2max results primarily from differences in maximal cardiac output. Therefore, VO_2max is closely related to the functional capacity of the heart. The most accurate method of measuring VO_2max is by direct measurement of oxygen uptake during maximal exertion. This is done with open-circuit spirometry during a maximal exercise test, which is usually performed using either a bicycle ergometer or a treadmill. Since direct measurement of VO_2max is technically demanding and requires expensive equipment, a number of alternative strategies for estimating VO_2max have been developed. Instead of estimating VO_2max from heart rate responses to submaximal exercise, tests have been developed that categorize cardiovascular fitness on the basis of a person's recovery heart rate following a standardized test protocol.

An example of such a test is the Young Men's Cristian's Associassion Step test, where the subject sits down immediately after exercise is completed and the heart rate is counted for 1 minute. Heart rate values are used to obtain a qualitative rating of fitness (ASCM, 2006).

The body's ability to maintain a level of exertion (exercise) for an extended time is a direct reflection of cardio respiratory fitness. It is determined by the body's ability to take up, distribute, and use oxygen during physical activity. The best quantitative measure of cardio respiratory endurance is maximal oxygen consumption, expressed as $\dot{V}\text{-O}_2\text{max}$, the amount of oxygen the body uses when a person reaches maximum ability to supply oxygen during exercise (measured in milliliters of oxygen used per minute for each kilogram of body weight). Maximal oxygen consumption can be measured precisely in an exercise physiology laboratory through analysis of the air a person inhales and exhales when exercising to a level of exhaustion (maximum intensity). This procedure can be expensive and time-consuming, making it impractical for the average person. (ASCM, 2006)

Three commonly used assessments are the following:

- ***The 1-mile walk test.*** This estimates level of cardio respiratory fitness (maximal oxygen consumption) based on the amount of time it takes you to complete 1 mile of brisk walking and heart rate at the end of walk. A fast time and a low heart rate indicate a high level of cardio respiratory endurance.
- ***The 3-minute step test.*** The rate at which the pulse returns to normal after exercise is also a good measure of cardio respiratory endurance; heart rate remains lower and recovers faster in people who are more physically fit. For the step test, step continually at a steady rate and then monitor heart rate during recovery.
- ***The 1.5-mile run-walk test.*** Oxygen consumption increases with speed in distance running, so a fast time on this test indicates high maximal oxygen consumption. (McArdle, W. D., F. I. Katch, and V. L. Katch. 2000).

2.12 Aerobics Exercises to Improve Cardio respiratory endurance and reduction of weight

Step aerobics for weight loss comes with many benefits to health including helping to burn belly fat while exercising and building cardiovascular fitness needed to move on to more advanced forms of aerobic exercise. When trying to burn belly fat combining aerobic step exercise with favorite workout makes a great circuit training routine. Step aerobics sometimes referred to as step aerobic exercise is an aerobic exercise that uses an elevated surface most likely a stepping surface to perform aerobic moves helping work on cardio fitness. (<http://slism.com/diet/step-aerobics-weight-loss.html>)

2.12.1 Benefits of Step Aerobics

Take a quick look at the ways aerobic step bench exercise can benefit us:

- It is a fun and low-impact exercise with amazing results.
- It helps burn out a huge amount of calories.
- It speeds up the process of effective weight loss.
- It tones up quite a few major muscles in our body, including the ones present in the butt and leg areas.

- It increases the flexibility of our body over time.
- It helps in improving our balance as well as endurance.)
- It is a hassle-free workout routine that can be modified as per the requirements and fitness levels of the practitioners.
- It effectively burns calories. For example, if you are a person with a body weight of 150 lbs, practicing step aerobics for 60 minutes a day can help you burn as much as 605 calories.
- It includes lifting the entire body from one foot to another while taking steps on and off the bench rhythmically. It helps in toning up the lower section of the body at a rapid pace. (<http://www.stylecraze.com/articles/benefits-of-step-aerobics-for-weight-loss>)

2. 12. 2 Physical Activities and Weight Control

Physical activity is important for physical health, emotional well-being, and achieving a healthy weight. Physical activity may help you control your weight by using excess calories that would otherwise be stored as fat. Most foods and many beverages you eat and drink contain calories, and everything you do uses calories. This includes sleeping, breathing, digesting food, and of course, moving around. Balancing the calories you eat with the calories you use through physical activity may help you maintain your current weight. (U.S. Department of Health and Human Services March 2003 Updated January 2007).

3. MATERIALS AND METHODS

Research methodology is the corner stone which guides our research. This section includes description and justification of chosen methodology and research methods which are implemented during the study. Hence these common elements description of the study area, source of data, study design, sample and sampling techniques, methods and procedures of data collection, method of data analysis on the effect of aerobic exercise on cardio respiratory endurance and weight reduction of overweight female students and ethical consideration were presented subsequently.

3.1 Description of the Study Area

Dilla is a market town and separate woreda in southern Ethiopia. It is the administrative center of the Gedeo Zone in the Southern Nations, Nationalities, and Peoples Region (SNNPR). Dilla University can be traced back to the year 1996 with its name, Dilla College of teachers' Education and Health Sciences. In 2001, the College was included in the then newly emerging University, Debu University. In 2004 it became Dilla University. It is located 3 km away from Dilla town in the Gedeo Zone, about 90 kilometers far from the city of South Nation Nationality and People Region, Hawassa and 360 kilometers from Addis Ababa. Currently more than 31,000 students take part in regular, summer, weekend and distance programmes. The University has six colleges, three schools and two institutes, training undergraduate and postgraduate programmes. The University offers 47 undergraduate, postgraduate (24 masters and 1 PHD) programmes. Currently, about 3000 academic and administration staff are working at the university (<http://www.du.edu.et>). Map of the study site is indicated on page 65.

3.2 Sources of Data

The primary data was obtained from the study subjects using fitness tests, Gymnasium works and experimental variables according to the designed procedures.

3.3 Research Design

The study was focused on experimental field study within 12 weeks of selected aerobic exercise on the examination of cardio-respiratory fitness and weight reduction of the subjects without control group. Pre Test, During Training Test and Post Test were used to collect data. The subject was practice different types of selected aerobic exercises ranges with light and moderate intensity mode trainings. Both training was done for 3 days per week with in 50 to 60 minutes duration. Indeed, the effect of these exercises on cardiorespiratory endurance and weight reduction of Dilla University overweight female students were studied.

3.3.1 Aerobic exercise trainings

Subjects in the exercise group were performed selected aerobic exercises at an intensity of 50-60% of their target heart rates at beginning. Training was performed three days in a week during 12 week each 50 to 60 min period. Each exercise class was start with 10 min warming-up exercises and ends with 5 min cooling down exercises. The exercise type which selected as aerobic exercise was; walking, jogging, rope jumping, step up and down, step aerobics.

3.4 Study Population and Participants of the Study

This study was include an experimental field test for Cardiorespiratory endurance as well as test for weight reduction before, during and after aerobic training totally three times on selected overweight female students. The total population of Dilla University overweight female students was 197 (one hundred and ninety seven) which counted after announcement. The research was conducted by selecting 30 overweight female students from the total population (Dilla University overweight female students, age 19 -24) by purposive sampling method based on prepared physical activity readiness questionnaire (PARQ).

3.5 Sample and Sampling Techniques

The purposive sampling techniques were used to select thirty (30) participants from population 197. The overweight female students (19 – 24) years of age group were participated under the study.

3.6 Inclusive and Exclusive Criteria

Thirty female students under graduate program with age range 19 – 24 were participated as a study subject. The overweight students (range from 24.9 to 29.9 kg/m²) who are free from any impairment or disability and chronic disease or who fulfill prerequisite questionnaire was included to the study. Female students of sport science department were excluded, because they participate in different kind of their course training. Those who cannot fulfill these criteria was also excluded from the study.

3.7 Data Collection Instruments

Data collection was performed quantitatively, including Exercise heart rate, Resting heart rate, waist to hip ratio test and BMI results. The use of these principal data collection instruments was intended to explore a range of quantitative information.

3.8 Methods and Procedures of Data Collection

The Experimental Cardio respiratory endurance as well as weight reduction test and exercise procedure was strictly administered and standardized in terms of administration, organization and implementation conditions.

The main reason for designing experimental study was to investigate the effect of progressive aerobic training on Cardio respiratory endurance and weight reduction. Young Mens Cristian Association step test (3 minute step test) and resting heart rate that designed in the study are more responsible for measuring the effectiveness training on Cardio respiratory endurance, body mass index and waist to hip ratio test was taken for measuring the effectiveness of weight reduction.

3.8.1 Body weight measurement

This measurement was taken by calibrated digital balanced beam scale in kilogram to measure the total body mass of the study subjects.

3.8.2 Body height measurement

This measurement was taken by calibrated height-weight measurement digital balanced beam scale in meter to measure the total body height of the study subjects.

3.8.3 Body Mass Index (BMI) for Weight Reduction Test

This measurement was taken purposely to calculate the percentage of total body height and weight ratio. Body mass index (BMI) is an estimate of fatness calculated as body weight (kg) divided by the square of body height (m²). $BMI = \text{Weight (kg)} \div \text{Height (m}^2\text{)}$ (WHO 2012).

3.8.4 The Cardio-Respiratory Fitness and Weight Tests and Procedures

In this study the sub-maximal cardio-respiratory fitness tests were applied regarding different considerations. The test mainly predicts the subject's cardiorespiratory endurance by determining the heart rate response workloads during the tests.

3.8.4.1 YMCA Step Test

A test for cardiorespiratory endurance, for three minutes, simply steps up and down the platform at a steady pace. The step test is performed using a 30 cm high bench. Then time how long it takes for your heart rate to normalize. The shorter the interval, the better cardiovascular condition is. This physical fitness test is also known as the Cardiac Stress Test or Cardiovascular Endurance Test. Where the subject sits down immediately after exercise is completed and the heart rate is counted for 1 minute. Heart rate values are used to obtain a qualitative rating of fitness (ASCM, 2006).

Procedures:

1. Stand facing step.
2. When ready to begin start the stopwatch or timer and begin stepping on and off the step to the following a cadence of up, up, down, down.
3. Continue for 3 minutes.
4. As soon as reach 3 minutes, stop immediately and sit down on step.
5. Perform a manual pulse reading and count the number of beats for an entire 60 seconds
6. Record pulse when have reached 1 minute and then locate score on the rating scale.

3.8.4.2 Weight Test (Waist to Hip Ratio and BMI)

Height and body mass was determined using standard methods. Waist to hip ratio circumference were measured by meter and body mass index were calculated by dividing weight (kg) by height in meter squared (m^2). Weight was measured by digital weight scale and height by meter. Waist and hip circumference were measured at the midpoint of the lowest rib and the iliac crest at the end of a gentle expiration. Hip circumference was taken at the maximum circumference of the hip. In both case the measurement recorded by using a flexible plastic tape. The average of two measurements was taking.

3.9 Data Quality Control

To ensure quality of the data, only standardized fitness were used. To reduce the mistakes occurred during data collection the assistant fitness test records were trained how to collect the appropriate data.

3.10. Cardio Respiratory Fitness Test Analysis

Three Minute Step Test- the participants were Step up and down, one foot at a time, onto the step or bench for 3 minutes. On Post Test, During Training Test and Post Test count the number of heartbeats.

Analysis of the result is by comparing it with the results of previous tests. It is expected that, with appropriate training between each test, the analysis was indicate an improvement.

3.11 Instrumentation

Anthropometric measurements were detected by calibrated weighing machine digital balanced beam scale in kilogram (kg) and calibrated measurement digital scale in meter for weight and height measurement and body mass index (BMI).

The, steeper and stop watch were used for YMCA step test. Dilla University fitness center Gym (Gymnasium) materials (steeper or box, rope, calibrating weighing machine, plastic meter and others) was also used as supporting materials of the study.

3.12 Methods of Data Analysis

Data was analyzed using computerized statistical package software (SPSS) version 20 using parametric statistics. The paired t-test was used to compare the pre and post training data. The level of significance was 0.05%.

3.13 Ethical Considerations

This study was going in line with ethical issues. The privacy of the participants was protected. Generally this research was conducted as pre rule, politics and research ethics of Haramaya University. The protocol was approved by the university guidelines. The participant was informed earlier and was give a signed agreement to participate in this study with a written letter. This research were approved by Department of Sport Science Academy of the Haramaya University to make sure it is not resulting to any risk or harm to the participants of this study.

4. RESULTS AND DISCUSSIONS

The study was tried to investigate effects of selected aerobic exercises on cardiorespiratory and weight reduction of overweight female students of Dilla university. The researcher selected some aerobic exercises and provided for the subjects for 12 weeks (3 months). The training was given three days per week (3days/week) for 50 to 60minutes per session in the afternoon session only from 5:00-6:00 AM local time. The exercise heart rate, resting heart rate, BMI and waist to hip ratio of the students were measured three times throughout the programs. That means pre training test, during training test and post training test for all the 30 subjects were collected in the same ways to determine the cardiorespiratory and reduction of weight. After data were collected in such away the researcher was analyzed data by paired t-test. The results of the study were discussed as follow.

4.1 Effects of aerobic exercise on exercise heart rate of the study participants

Table1. Mean values and standard deviation of exercise heart rate of Dilla university overweight female student's pre, during and post selected exercise program.

N	Mean of Age	V	Mean \pm SD			Mean Difference	Sign.
			PT	DTT	PoT		
30	21	EHR	108.3000 \pm 5.87 308	106.6333 \pm 5.7 26	104.5000 \pm 5.679 67	3.80000	.000

Values mean \pm standard deviation, PT = pre training test, DTT=during training test and PoT= post training test N=number of study subjects, EHR= exercise heart rate

Tables 1 showed that exercise heart rate. It showed that the mean value and standard deviation of exercise heart rate was decreased. As the data (table 1) shows there were a significant improvement on the exercise heart rate of the students as a result of selected aerobic exercises of 12 weeks of continuous training programs. The pre, during and post training tests mean value for exercise heart rate (YMCA step test) were 108.30, 106.6333 and 104.50 respectively. The mean difference value was 3.80. These results indicate that there was progressive decrease in exercise heart rate of the participants.

The performance of the students before the training in average were 108.30, that means the students were above the average, (according to the standard) their exercise heart rate during the training test (after 45 days) was 106.633 on average which indicates there were change in their exercise heart rate and they scored average score (according to the standard) and their post training test was 104.50 heart rate in average, it also shows that there is change in their cardiorespiratory endurance again and now the final result shown the students scored average scores according to table 15(appendix I) standard. This shows that the selected aerobic exercises have significant importance on the improvement of cardiorespiratory endurance of the students.

The above table indicates the results of the participants progressively improved due to the selected aerobic training which was provided for 12 weeks. So we have seen on the table the standard error mean value was small which means less than $p < 0.05$, means the result was significant, so the result indicates 95% confidence interval of the difference was achieved. So, the alternative hypothesis was accepted and null hypothesis was rejected.

The researcher selected different types of aerobic training which provided for the students in 12 weeks of training programs. In 3 months of training the students performed each aerobic exercises 3 times in the same interval and conditions with only changed intensity from from light to medium. These trainings were walking, jogging, rope jumping, step up and down and step aerobics. These selected aerobic training programs were scheduled according to appendix D. The study indicates that aerobic training is a key to bring the improvement in the cardiorespiratory endurance. This investigation was supported by many studies.

Results matched with the finding of Selvalakshmi (2007) conducted a study on the effect of varied training programs on obese women working in IT companies for the purpose of the study. For this study, the obese women were grouped into three namely, control, floor aerobic and step aerobics group. The collected data on the cardiorespiratory parameters prior to and after 12 weeks of varied aerobics training were statistically analyzed using analysis of covariance (ANCOVA) as recommended by Clarke (1972).

Aerobic activities should be used to develop cardio respiratory endurance. Basically aerobic activities are those in which a sufficient amount of oxygen is available to meet the body's demands. During the performance of evaluated level for an extended period, this activity typically involves vigorous and repetitive whole body or large muscle and movements that sustained for an extended period. Popular aerobic activities including running, walking, rowing, swimming, cycling aerobic dancing, jogging, treadmill and somewhat continuous in nature the intensity of work load can be easily regulated by controlling the pace (Shemelis, 2010).

Cardio respiratory endurance improves with regular participation in aerobic activities, such as speed walking, jogging, cycling, swimming, cross-country skiing, and many others. The term **aerobic** means "with oxygen," but when applied to exercise, it refers to activities in which oxygen demand can be met continuously during performance. The physiological changes that result from cardio respiratory training are referred to as the long-term, or chronic, effects of exercise. The effects of training are measurable and predictable (Highered.mcgraw-hill.com, 2013).

4.2 Effects of aerobic exercise on resting heart rate of the study participants

Table2. Mean values and standard deviation of resting heart rate of Dilla university overweight female student's pre, during and post selected exercise program.

N	V	Mean \pm SD			Mean Difference	Sign.
		PT	DTT	PoT		
30	RHR	79.5667 \pm 2.88 496	77.8333 \pm 2.81 723	75.9333 \pm 2.815 39	3.63333	.000

Values mean \pm standard deviation, PT = pre training test, DTT=during training test and PoT= post training test N=number of study subjects RHR= resting heart rate.

Table2. Indicates the pre, during and post training tests mean value for resting heart rate were 79.5667, 77.833 and 75.933, respectively. The mean difference was 3.633. These results indicate that there were progressive decrease in resting heart rate of the participants or decrease in their times. This shows that the selected aerobic exercises have significant importance on the decrement of RHR of the students.

The performance of the students on pre training was on average were, 79.5667 that means the athletes were below the average, (according to the standard) their RHR during the training test (after 45 days) was 77.833 in average which indicates there were change in their RHR and they scored average score (according to the standard) and their post training test was 75.933 in average, it also shows that there is decrement in their resting heart rate again and now the final result shown the students scored average scores according to table 16(appendix I) standard. So, the alternative hypothesis was accepted and null hypothesis was rejected. The study indicates that aerobic training is a key to decrease in the resting heart rate. This investigation was supported by many studies.

Results matched with the finding of Selvan and Sudha (2008) conducted a study on selected effect of aerobic exercise on selected physiological variables among college girls. For this study aerobic exercise uses large muscle groups rhythmically and continuously and elevates the heart rate and breathing for a sustained period. Common examples includes walking, jogging/running, swimming, rowing, stair climbing, bicycling, cross country skiing, step and dance exercise classes, roller skating, and the more continuous forms of tennis, racquet ball and squash. To achieve this purpose, 60 girls were selected from TheivannaiAmmal College for women, Villupuram. The age group of the subjects ranged between 18 to 20 years. The results for the study revealed that aerobic exercise had a significant effect in the improvement of the physiological variables such as resting pulse rate, breath holding time.

A few months of aerobic training lowers the resting heart rate by 10 to 15 beats per minute (bpm). It also lowers the heart rate for a given workload. For example, a slow jog may produce a heart rate of 165 beats per minute before training and 140 beats per minute after a few months of training. The trained heart is a stronger, more efficient pump capable of delivering the required blood and oxygen with fewer beats (Highered.mcgraw-hill.com, 2013).

A study conducted on the effect of twelve week aerobic exercise program on health related physical fitness components and blood lipids in obese girls by Ozcan and Mehmet (2011) showed a significant decrease 5.73% in resting heart rate.

The result of a study conducted by Odiango et al., (2010) on effect of physical exercise program on health-related fitness components (cardio respiratory endurance, low back flexibility and body composition) of physically challenged pupils also reported similar results reported in this study. The result of the study showed pupils recorded lower heart rate in the posttest as compared to pretest. This was an indication that the physical exercise program was effective in improving subjects resting heart rate.

4.3 Effects of aerobic exercise on Body Mass Index of the study participants

Table 3. Mean values and standard deviation of Body Mass Index of Dilla university overweight female student's pre, during and post selected exercise program.

N	V	Mean \pm SD			Mean Difference	Sign.
		PT	DTT	PoT		
30	BMI	26.2813 \pm 1.21 440	25.7610 \pm 1.26 901	24.4560 \pm 1.193 32	1.82533	.000

Values mean \pm standard deviation, PT = pre training test, DTT=during training test and PoT= post training test, N=number of study subjects BMI= body mass index,

Tables 3 showed that body mass index mean value. It showed that the mean value of body mass index was decreased. As the data (table 3) shows there were a significant change on the body mass index of the students as a result of selected aerobic exercises of 12 weeks of continuous training programs. The pre, during and post training tests mean value for body mass index were 26.2813 kg/m², 25.7610kg/m² and 24.4560 kg/m², respectively. The mean defference of the subject was 1.82533. These results indicate that there was progressive decrease in body mass index of the participants.

This shows that the selected aerobic exercises have significant importance on the reducing of BMI of the students. The body mass index of the students before the training in average were 26.2813 kg/m², that means the students were overweight, (according to the standard) their BMI during the training test (after 45 days) was 25.7610kg/m² in average which indicates there were change in their BMI and they scored overweight (according to the standard) and their post training test was 24.4560kg/m² in average, it shows that there was change in their body mass index means, they are healthy body mass index table 18(appendix I) standard. So, the alternative hypothesis was accepted and null hypothesis was rejected.

The above table indicates the results of the Participants progressively improved due to the selected aerobic training which was provided for 12 weeks. So we have seen on the table the standard error mean value was small which means less than $p < 0.05$ so the result indicates 95% confidence interval of the difference was achieved.

The researcher selected different types of aerobic training which she provided for the students in 12 weeks of training programs. In 3 months of training the students performed each aerobic exercise 3 times per week. These trainings were walking, jogging, rope jumping, step up and down and step aerobics. These selected aerobic training programs were scheduled according to appendix F. The study indicates that aerobic training is a key to decrease the body mass index. This investigation was supported by many studies.

Results matched with the finding of ozturk, 2011 in mugale, turkey conducted the study on the effect of twelve week aerobic exercise program on health related physical fitness components and blood lipids in obese girls. The aim of the study was to investigate the effects of 12 week aerobic program on health related fitness components and blood lipids in obese girls. In this study, a total of 40 girls were recruited as exercise group ($n=20$) and control group ($n=19$). Participants joined sessions for 60 min per day, 3 days per week for 12-week. There were significant differences in weight body mass index (BMI), flexibility, sit-ups, hand grip for both hands, skin fold measurements (thigh, triceps, abdomen, super iliac, sup scapula, chest, body fat percent, heart rate, high density lipoproteins, low density lipoproteins, total cholesterol, and triglyceride between pre-test and post scores in the exercise group ($p < 0.05$).

Regular aerobic exercise will produce beneficial effects for any age group providing the exercise is specific and appropriate to the level of fitness of the individual. Progressive exercise correctly performed will increase the level of fitness, reduce weight and improve health. It will also create a sense of wellbeing, produce greater energy and reduce the risk of developing many diseases. Exercise makes demands on the body systems over and above normal every day activities and as result the systems adapt anatomically and physiologically (Rosser, 2001).

Physical activity may help you control your weight by using excess calories that would otherwise be stored as fat. Most foods and many beverages you eat and drink contain calories, and everything you do uses calories. This includes sleeping, breathing, digesting food, and of course, moving around. Balancing the calories you eat with the calories you use through physical activity may help you maintain your current weight. (U.S. Department of Health and Human Services March 2003 Updated January 2007).

4.4 Effects of aerobic exercise on Waist to Hip Ratio of the study participants

Table 4. Mean values and standard deviation of Waist to Hip ratio of Dilla university overweight female student's pre, during and post selected exercise program.

N	V	Mean \pm SD			Mean Difference	Sign.
		PT	DTT	PoT		
30	WHR	0.8783 \pm .03553	0.8747 \pm .04032	0.8330 \pm .02973	.04533	.000

Values mean \pm standard deviation, PT = pre training test, DTT=during training test and PoT= post training test, N=number of study subjects, WHR=waist to hip ratio.

Table 4. Indicates the pre, during and post training tests mean value for waist to hip ratio were .8783cm, .8747cm and .833cm respectively. The mean defference of the subjects were 0.04533 cm. These results indicate that there was progressive decrease in waist to hip ratio of the participants. This shows that the selected aerobic exercises have significant importance to decrease WHR ratio of the students.

The pre training in average were .8783cm, that means the students were at risk, (according to the standard) their WHR ratio during the training test (after 45 days) was .8747cm in at risk score (according to the standard) and their post training test was .8330cm in average, it shows that there is change in their waist to hip ratio again and now the final result shown the students scored average scores according to table 17(appendix I) standard. So, the alternative hypothesis was accepted and null hypothesis was rejected.

The above table indicates the results of the Participants progressively improved due to the selected aerobic training which was provided for 12 weeks. So we have seen on the table the standard error mean value was small which means less than $p < 0.05$ so the result indicates 95% confidence interval of the difference was achieved. The researcher selected different types of aerobic training which she provided for the students in 12 weeks of training programs. In 3 months of training the students performed each aerobic exercise 3 times per week. The study indicates that aerobic training is a key to decrease in the waist to hip ratio. This investigation was supported by many studies.

Results matched with the finding of (2015 S. Karger GmbH, Freiburg) It is important therefore to note that the combined exercise group decreased minimal waist circumference significantly. However, the after training group trended ($P=0.04$) toward significantly decreased waist circumference. We observed decreases in body mass (and thus BMI) as well as in waist and hip circumference. The decrease in waist circumference is especially important to reduce weight. Significant decreases in total body fat mass, and waist and hip circumference were observed after aerobic training.

(Arslan, 2011), also Conducted the study on the effects of an eight-week step- aerobic dance exercise program on body composition parameters in middle-aged sedentary obese women in aksaray turkey. This study comprised an eight-week randomized controlled trial. For this study a total of 49 healthy sedentary obese women participated voluntarily. They were randomly divided into two groups; those undertaking a step-aerobic dance exercise program ($n=29$) and a control group ($n=20$). The subjects took part in a step-aerobic dance exercise program for one hour per day, three days a week for eight weeks. The subjects Body Mass Index (BMI), weight, waist

circumference, waist-hip ratio was assessed before and after the completion of the step-aerobic dance exercise program. After the eight weeks of the step-aerobic dance exercise program, significant differences were found in the subjects weight, BMI, body composition parameters, waist-hip ratio (WHR), waist circumference, fat percentage, lean body mass and basal metabolism rate in the group ($p < 0.05$).

4.5 Paired sample T-test of parameters of all variables of study subjects

Table: 5 : Pre-During and Pre-Post Test of all variables of study subjects

	Mean	Std. deviation	Std. error mean	95% confidence interval of the difference		t	Df	Sig.(2tailed)
				Lower	Upper			
				Pre EHR-during EHR	1.66667			
Pre EHR-Post EHR	3.80000	1.21485	.22180	3.34637	4.25363	17.133	29	.000
Pre RHR-during RHR	1.73333	.90719	.16563	1.39458	2.07208	10.465	29	.000
Pre RHR-Post RHR	3.633	1.8855	.21700	3.18952	4.07714	16.744	29	.000
Pre BMI-during BMI	.52033	.23151	.04227	.43389	.60678	12.310	29	.000
Pre BMI-Post BMI	1.82533	.49463	.09031	1.64063	2.010	20.21	29	.000
Pre WHR-during WHR	.00367	.00850	.00155	.00049	.00684	2.362	29	.025
Pre WHR-Post WHR	.04533	.01279	.00234	.04056	.05011	19.408	29	.000

Table 5 Shows, paired t- test, which is, Pre-During test result and Pre-Post test result of exercise heart rate , resting heart rate, body mass index and waist to hip ratio.

The benefit of aerobic exercise is myriad. They include systemic changes such as reduced cholesterol and blood pressure, improved muscular endurance, reduced body fat, increased metabolism. Aerobic activities strengthen the heart and lungs, making them more efficient and durable, improving quality and quantity of life. Exercise not only extends the life, but also gives you more energy to live it to the fullest. Aerobic exercise allows your body to use fats and sugars more efficiently burns lots of calories and plays an important role in reducing the onset and symptoms of aging and illness. Aerobic exercise reduces your risk of heart disease, vascular disease and diabetes and can help those trying to quit smoking by relieving cravings and improving lung function. (Kathleen, 2006).

Regular exercise causes your body to make adjustments that result in improved health and physical functioning. Continuing with regular exercise enables your body to maintain these benefits. Regularly doing the right types of aerobic exercise at the correct intensity, and for an appropriate duration, results in the most benefit. The benefit of aerobic exercise can be broadly categorized as either ‘fitness’ (physical capacity) or ‘health’. Fitness and health are linked, and most forms of aerobic exercise will help you achieve both. Regular aerobic exercise improves your cardiovascular fitness by increasing your capacity to use oxygen. Low Impact aerobic exercise such as, swimming is valuable for improving general health and fitness in people who have arthritis or other conditions that limit their ability to do weight bearing exercise. Importantly, whereas fitness tends to be quite specific, many health benefits can be gained from any form of aerobic exercise. Additionally, the health gains can be achieved from relatively moderate of exercise can lead to substantial improvements in health. (Thomas et al. 2008).

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This section includes summary, conclusions and recommendations.

5.1. Summary

This study assessed effects of selected aerobic exercises on exercise heart rate, resting heart rate, body mass index and waist to hip ratio of overweight female students of Dilla University. Major findings of this study are improvement of cardiorespiratory endurance and weight reduction after participation in 12 weeks aerobic exercise program.

All subjects under study took part in experimental design pre, during and post training tests from November to January in 2017/2018. For this study, 3 minutes step test was used to measure cardiorespiratory endurance of students, resting heart rate was measured at morning before eating breakfast, height and weight test was used to measure body mass index of students, waist and hip circumference was also used to measure waist to hip ratio of students. The analysis of data were done through paired t-test to see the difference if any. The level of significance was set at 0.05.

The effects of selected aerobic exercise on improving; cardiorespiratory endurance and weight reduction were studied. Cardiorespiratory endurance measures (YMCA step test, resting heart rate) and reduction of weight measures (height, weight and body mass index) and waist to hip ratio (waist and hip circumference) were tested pre; during and post exercise training program. Test results from pre training to post training showed significant improvements in all parameters.

The pre test and post test results of cardiorespiratory endurance indicates that aerobic exercise significantly improved. Better improvement was observed in cardiorespiratory endurance (exercise heart rate and resting heart rate) and body mass index decreased due to aerobic exercises. The weight of overweight female students was decreased after training. Body mass index of participants of Dilla university overweight female students are 18.9– 24.9 (healthy range) of World Health Organization standard.

5.2 Conclusions

Based on the major finding of the study the following points are stated as conclusion.

- ❖ Training of selected aerobic exercise was found to be effective tool of improving Cardiorespiratory endurance and weight reduction of Dilla university overweight female students.
- ❖ Aerobic exercise had significant effect on reduction of Weight and body mass index of overweight female students.
- ❖ Cardiorespiratory endurance changed significantly. This was because aerobic exercise program had positive effect on decreasing exercise heart rate and resting heart rate.
- ❖ Aerobic exercise had significant effect on decreasing of waist to hip ratio of overweight female students.
- ❖ The aerobic exercise program had significant importance in decreasing weight.

5.3 Recommendations

Based on the finding of this study it is important to state the following points as a recommendation:-

- ✦ Sport science professionals and departments need to guide and educate the importance of aerobic exercise along with well planned program of specific aerobic training exercises with an increase in the training period to improve their heart rate.
- ✦ University students should be participate in regular aerobics exercise to reduce their body mass index and stay themselves in healthy (normal) body mass index as well as waist to hip ratio.
- ✦ Aerobic exercise may serve as immediate indicator of potential health risks for overweight.
- ✦ According to the finding the selected and appropriate aerobic training will bring the former results in overweight female students of dilla university, followed by several sport specific warming up exercises performed at a light intensity. Each student should be physically and emotionally prepared to participte in a aerobic training program.
- ✦ The subject in this study belongs to the overweight female students. Further study is essential on overweight male and female students along with well planned program of specific aerobic exercises training with an increase in the training period.
- ✦ The present study is for limited number of participants and for a short period o time, it needs further study on larg participant and for a long period of time to improve cardiorespiratory endurance of the participants.

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7. APPENDIXES

APPENDIX- A: Participants Information Sheet and a Consent Form

Researcher`s name: Fanose Demisse Belachew

Major Advisor`s name: Shemelis Mekonnen (PhD)

Co-Advisor`s name: Desta Enyew (PhD)

Thesis Title: Effect of Selected Aerobic Exercises on Cardiorespiratory Endurance and Weight Reduction of Overweight Female Students in case of Dilla University

You are being asked to participate in this research study as described below. All research studies carried out like this one are governed by the regulations for research on human beings. These regulations require that the researcher should obtain a sign agreement (consent) from you to participate in this research project. The researcher was explaining to you in the detail purpose of the project, the procedures to be used, the potential benefits and the possible risk of participation in this study. You can ask a researcher any questions that you may have about a study and expect to receive satisfactory answers regarding the same. A basic explanation of the project is summarized below.t

1. Purpose and procedures

The purpose of this research project is to examine cardio respiratory endurance and weight reduction of overweight female students in Dila University. The subjects to be involved in this study were 30 female students. This study requires your participation to perform a certain tests in measuring the cardio respiratory endurance variables and weight reduction.

2. Risks and Safeguards

The risks of this research study are small. While administering the tests and during training sessions you may experience localized muscle fatigue in your thigh i.e., cardiac muscle.

You might feel some muscle soreness and fatigue during and after the cessations of the training exercises and tests. But we do not expect any unusual risks as a direct result of this study. If any unexpected physical injury occurs, appropriate first aid was provided, but no financial compensation was given.

2 Confidentiality:

The information obtained about you was kept in confidence, although you are free to release it to your own physician. The information was used only for scientific purposes without identifying you as an individual.

I certify that I have and fully understood the above project; therefore, I consent to participate in this study.

Name of Subject: -----

Signature: -----

Address: -----

Date: -----

I certify that I clearly explained the nature of the study, purpose of potential benefits and that may be possible risks involved in this research study.

Signature of Investigator: -----

Date: -----

APPENDIX- B: Physical Activity Readiness Questionnaire (PAR-Q)

Many health benefits are associated with regular exercise, and the completion of the PAR-Q is a sensible first step to take if you are planning to increase the amount of physical exercise in your life. For most people, physical activity should not pose any problem or hazard. The PAR-Q is designed to identify the small number of adults for whom physical activity might be inappropriate or those who should seek medical advice concerning the type of activity most suitable for them.

Table: 1. For Students; Please read the following questions carefully and indicate your correct responses to each question by encircle “YES” or “NO” options.

NO	Questions	Yes	No
1	Do you have a bone or joint problem such as arthritis, which has been aggravated by exercise or might be made worse with exercise?		
2	Do you have high blood pressure?		
3	Do you have low blood pressure?		
4	Do you have Diabetes mellitus or any other metabolic disorder?		
5	Do you have or ever suffered from heart condition?		
6	Have you ever felt pain in your chest when you do physical exercise?		
7	Is your physician currently prescribing you drugs or medication?		
8	Have you ever suffered from shortness of breath at rest or with mild exercise?		
9	Is there any history of Coronary Heart Disease within your family?		
10	Do you ever feel faint, have spells of dizziness or have ever lost consciousness?		

- 11 Do you currently smoke?
- 12 Do you **NOT** currently exercise regularly (at least 2 times per week) and/or work in a job that is physically demanding.
- 13 Are you, or is there any possibility that you might be pregnant?
-

If you have answered **YES** to any of the above questions please give details: _____

Name: -----

Sign: -----

Source: *Canadian Society for Exercise Physiology*. Revised 1994

APPENDIX-C: Description of the Training Schedule

In sport training it needs well designed and prepared plan. The purpose of training plan is to identify the work to be carried out to achieve agreed objectives and to be effective in the training program outcomes. Sports fitness training plans are the strategies for achieving peak performance. In sports training plan goals or objectives should be specified, participants fitness level should be assessed before, and after training, exercise should be selected and it should follow the training principles and it should be well adjusted to the participant`s fitness level and to the weather condition.

Planning the session and the training weeks

Based on the above mentioned reasons and others the researchers was use the training principles, this training session is designed for three months, and based on the principles of frequency, intensity, type and principle of rest and recover it was a three days per week, one day split (rest day) in between exercise session with 50 to 60 minutes.

Training frequency

Frequency refers to the number of training sessions per a specific period of time such as week and month or year following any form of fitness training, through a process of rebuild to replenish its energy reserves consumed by the exercise.

Exercise intensity

Exercise intensity refers to how hard the body is working during physical activity. Exercise intensity is described as low, moderate, or vigorous.

The ranges of exercise intensity

- Beginner or low fitness level: 50% to 60%
- Intermediate or average fitness level: 60% to 70%
- Advanced or high fitness level: 75% to 85%

For moderate intensity physical activity, a person`s THR (Target Heart Rate) should be 50-70 per cent of their maximum heart rate. The maximum heart rate is based on a person`s age. An estimate of a person`s maximum heart rate can be calculated as 220 beats per minute minus your age (<http://www.sparkpeople.com>)

APPENDIX- D: Aerobic training schedule for three months

Table: 2 First month training schedule (**November, 2017**), Total Duration 600min

Days per week	Types of Exercises	Duration (50min)	Frequency (Rep/ sets)	Rest	Intensity of exercise
Monday 5:00pm-5:50pm	1.Warming up exercise Different types of General and specific warming up was employed	10min	-		Light intensity 50-60%
	2.main work out				
	Walking	4min			
	Jogging	4min			
	Rope jumping	7min	42x3	1min per set	
	Sep up and down	6min	17x2	1min per set	
	Step aerobics exe.	8min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		
Wednesday 5:00pm-5:50pm	1.Warming up exercise: Different types of General and specific warming up was employed sessions.	10min	-		Light intensity 50-60%
	2. main work out				
	Walking	4min			
	Jogging	4min			
	Rope jumping	7min	42x3	1min per set	
	Sep up and down	6min	17x2	1min per set	
	Step aerobics exe.	8min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		
Friday 5:00pm-5:50pm	Warming up exercise: Different types of General and specific warming up was employed	10min	-		Light intensity 50-60%
	2. main workout				
	Walking	4min			
	Jogging	4min			
	Rope jumping	7min	42x3	1min per set	
	Sep up and down	6min	17x2	1min per set	
	Step aerobics exe.	8min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		

The above schedule is prepared based on description of training plan.

Table: 3 Second Month training Schedule (**December, 2017**), Total Duration 660min

Days per week	Types of Exercises	Duration (55min)	Frequency (Rep/ sets)	Rest	Intensity of exercise
Monday 5:00pm-5:55pm	1.Warming up exercise Different types of General and specific warming up was employed	10min	-		Moderate intensity 60-70%
	2.main work out				
	Walking	4min			
	Jogging	4min			
	Rope jumping	9min	46x3	1min per set	
	Sep up and down	6min	19x2	1min per set	
	Step aerobics exe.	11min	-	1min	
3. Cooling down: different types of stretching exe.	5min	-			
Wednesday 5:00pm-5:55pm	1.Warming up exercise: Different types of General and specific warming up was employed	10min	-		Moderate intensity 60-70%
	2. main work out				
	Walking	4min			
	Jogging	4min			
	Rope jumping	9min	46x3	1min per set	
	Sep up and down	6min	19x2	1min per set	
	Step aerobics exe.	11min	-	1min	
3. Cooling down: different types of stretching exe.	5min	-			
Friday 5:00pm-5:55pm	Warming up exercise: Different types of General and specific warming up was employed	10min	- -		Moderate intensity 60-70%
	2. main workout				
	Walking	4min			
	Jogging	4min			
	Rope jumping	9min	46x3	1min per set	
	Sep up and down	6min	19x2	1min per set	
	Step aerobics exe.	11min	-	1min	
3. Cooling down: different types of stretching exe.	5min	-			

The above schedule is prepared based on description of training plan.

Table: 4 Third Month Training Schedule (**January, 2018**), Total Duration 720min

Days per week	Types of Exercises	Duration (60min)	Frequency (Rep/ sets)	Rest	Intensity of exercise
Monday 5:00pm-6:00pm	1.Warming up exercise Different types of General and specific warming up was employed	10min	-		Moderate intensity 60-70%
	2.main work out				
	Walking	5min			
	Jogging	4min			
	Rope jumping	8min	46x4	1min per set	
	Sep up and down	8min	20x3	1min per set	
	Step aerobics exe.	12min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		
Wednesday 5:00pm-6:00pm	1.Warming up exercise: Different types of General and specific warming up was employed	10min	-		Moderate intensity 60-70%
	2. main work out				
	Walking	5min			
	Jogging	4min			
	Rope jumping	8min	46x4	1min per set	
	Sep up and down	8min	20x3	1min per set	
	Step aerobics exe.	12min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		
Friday 5:00pm-6:00pm	Warming up exercise: Different types of General and specific warming up was employed	10min	- -		Moderate intensity 60-70%
	2. main workout				
	Walking	5 min			
	Jogging	4min			
	Rope jumping	8min	46x4	1min per set	
	Sep up and down	8min	20x3	1min per set	
	Step aerobics exe.	12min	-	1min	
	3. Cooling down: different types of stretching exe.	5min	-		

The above schedule is prepared based on description of training plan.

APPENDIX- E: Test Record Sheet of Subjects

Table: 5 Test Record Sheet of Subjects for all variables

Name _____ Height _____ BMI _____
 Weight _____ Age _____

No	Type of Test	Primary factor to be measured	Unit	PT	DTT	PoT
1	YMCA step test	Cardiorespiratory endurance	Beat/min	RHR	EHR	RHR EHR RHR EHR
2	Waist to hip ratio	Circumference	Cm			
3	Body mass index	BMI	Kg/m ²			

APPENDIX- F: Test Recorded data sheet of study subjects

Table: 6. Raw data of BMI and WHR Measurement recorded data sheet of the study subjects (pre training).

S.No.	Name of Subjects	Age	Height	Weight	BMI (kg/m ²)	Waist	Hip	WHR (cm)
1	Sample1	20	1.62	73.9	28.2	95	104	.91
2	Sample2	21	1.51	63.5	27.85	97	109	.88
3	Sample3	19	1.48	63.3	28.90	95	107	.88
4	Sample4	19	1.65	70.7	25.99	98	114	.85
5	Sample5	23	1.61	70	27.0	94	105	.89
6	Sample6	24	1.65	81	29.77	101	126	.80
7	Sample7	21	1.55	63.6	26.5	93	105	.88
8	Sample8	22	1.58	64.5	25.9	89	100	.89
9	Sample9	21	1.66	69	24.94	85	106	.80
10	Sample10	22	1.56	61	25.07	89	99	.89
11	Sample11	22	1.61	69.7	26.91	82	102	.80
12	Sample12	20	1.55	60	24.91	84	95	.88
13	Sample13	21	1.60	65.8	25.7	90	103	.87
14	Sample14	22	1.56	62.8	25.84	88	99	.88
15	Sample15	19	1.54	62.3	26.28	92	103	.89
16	Sample16	21	1.60	64.5	25.19	99	103	.96
17	Sample17	20	1.66	69.4	25.23	94	107	.87
18	Sample18	22	1.64	70.9	26.45	87	101	.86
19	Sample19	21	1.62	69	26.33	92	102	.90
20	Sample20	23	1.55	65	27.08	91	105	.86
21	Sample21	21	1.49	58.6	26.39	77	89	.86
22	Sample22	20	1.61	65	25.09	89	98	.90
23	Sample23	22	1.64	67.4	25.14	90	104	.86
24	Sample24	21	1.51	59.2	25.96	87	92	.94
25	Sample25	21	1.58	66	26.5	85	95	.89
26	Sample26	21	1.71	74.3	25.44	97	111	.87
27	Sample27	20	1.54	60.1	25.35	91	103	.88
28	Sample28	22	1.7	80	27.68	90	102	.88
29	Sample29	20	1.52	58	25.1	86	94	.91
30	Sample30	21	1.61	66	25.48	84	91	.92

- *BMI: Body Mass Index, WHR: Waist to Hip Ratio.*

Table: 7. Raw data of RHR & EHR Measurement recorded data sheet of the study subjects for Cardiorespiratory endurance (pre training).

S.No.	Name of Subjects	Age	RHR (b/m)	Remark	Age	EHR (b/m)
1	Sample1	20	76		20	109
2	Sample2	21	79		21	106
3	Sample3	19	81		19	100
4	Sample4	19	80		19	102
5	Sample5	23	79		23	103
6	Sample6	24	77		24	110
7	Sample7	21	76		21	111
8	Sample8	22	75		22	99
9	Sample9	21	77		21	100
10	Sample10	22	78		22	112
11	Sample11	22	82		22	115
12	Sample12	20	85		20	108
13	Sample13	21	78		21	113
14	Sample14	22	80		22	118
15	Sample15	19	76		19	109
16	Sample16	21	83		21	110
17	Sample17	20	83		20	119
18	Sample18	22	81		22	101
19	Sample19	21	79		21	120
20	Sample20	23	82		23	104
21	Sample21	21	80		21	108
22	Sample22	20	79		20	99
23	Sample23	22	79		22	103
24	Sample24	21	78		21	111
25	Sample25	21	84		21	109
26	Sample26	21	85		21	114
27	Sample27	20	78		20	108
28	Sample28	22	77		22	107
29	Sample29	20	76		20	114
30	Sample30	21	84		21	107

- *RHR: Resting Heart Rate, EHR: exercise heart rate, b/m: beat per minute*

Table: 8. Raw data BMI and WHR Measurement recorded data sheet of the study subjects (During training).

S.No.	Name of Subjects	Age	Height	Weight	BMI (kg/m ²)	Waist	Hip	WHR (cm)
1	Sample1	20	1.62	72	27.4	95	104	.91
2	Sample2	21	1.51	62.2	27.28	97	109	.88
3	Sample3	19	1.48	63	28.76	95	107	.88
4	Sample4	19	1.65	69.9	25.69	98	114	.85
5	Sample5	23	1.61	68.6	26.48	94	105	.89
6	Sample6	24	1.65	80.1	29.44	98	125	.78
7	Sample7	21	1.55	62	25.83	93	105	.88
8	Sample8	22	1.58	63.8	25.62	89	100	.89
9	Sample9	21	1.66	67.3	24.47	83	106	.78
10	Sample10	22	1.56	59.9	24.65	89	99	.85
11	Sample11	22	1.61	68.5	26.44	82	102	.80
12	Sample12	20	1.55	58.8	24.5	84	95	.88
13	Sample13	21	1.60	63.4	24.76	87	102	.85
14	Sample14	22	1.56	62	25.51	88	99	.88
15	Sample15	19	1.54	61.1	25.78	92	103	.89
16	Sample16	21	1.60	62.8	24.53	99	103	.96
17	Sample17	20	1.66	66.8	24.2	94	107	.87
18	Sample18	22	1.64	68.7	25.6	87	101	.86
19	Sample19	21	1.62	68.2	26.0	92	102	.90
20	Sample20	23	1.55	63	26.25	91	105	.86
21	Sample21	21	1.49	57.7	25.99	74	89	.83
22	Sample22	20	1.61	65	25	89	98	.90
23	Sample23	22	1.64	66.6	24.85	86	102	.84
24	Sample24	21	1.51	58.4	25.61	87	92	.94
25	Sample25	21	1.58	65	26.1	85	95	.89
26	Sample26	21	1.71	72.4	24.7	97	111	.87
27	Sample27	20	1.54	58.4	24.6	91	103	.88
28	Sample28	22	1.7	78.8	27.26	90	102	.88
29	Sample29	20	1.52	56.9	24.63	86	94	.91
30	Sample30	21	1.61	64.5	24.9	84	91	.92

- *BMI: Body Mass Index, WHR: Waist to Hip Ratio.*

Table: 9. Raw data of RHR & EHR Measurement recorded data sheet of the study subjects for cardiorespiratory endurance (during training).

S.No.	Name of Subjects	Age	RHR (b/m)	Remark	Age	EHR (b/m)	Remark
1	Sample1	20	75		20	107	
2	Sample2	21	77		21	105	
3	Sample3	19	80		19	99	
4	Sample4	19	78		19	100	
5	Sample5	23	77		23	102	
6	Sample6	24	76		24	108	
7	Sample7	21	74		21	109	
8	Sample8	22	75		22	99	
9	Sample9	21	76		21	98	
10	Sample10	22	74		22	111	
11	Sample11	22	80		22	113	
12	Sample12	20	81		20	106	
13	Sample13	21	76		21	111	
14	Sample14	22	79		22	116	
15	Sample15	19	75		19	104	
16	Sample16	21	81		21	110	
17	Sample17	20	83		20	118	
18	Sample18	22	80		22	100	
19	Sample19	21	77		21	118	
20	Sample20	23	81		23	103	
21	Sample21	21	78		21	106	
22	Sample22	20	77		20	97	
23	Sample23	22	76		22	103	
24	Sample24	21	77		21	110	
25	Sample25	21	82		21	106	
26	Sample26	21	83		21	112	
27	Sample27	20	76		20	106	
28	Sample28	22	75		22	106	
29	Sample29	20	74		20	112	
30	Sample30	21	82		21	104	

- *RHR: Resting Heart Rate, EHR: exercise heart rate, b/m: beat per minutes*

Table: 10. Raw data of BMI and WHR Measurement recorded data sheet of the study subjects (post training).

S.No.	Name of Subjects	Age	Height	Weight	BMI (kg/m ²)	Waist	Hip	WHR (cm)
1	Sample1	20	1.62	68.1	25.99	91	103	.88
2	Sample2	21	1.51	58	25.43	92	108	.85
3	Sample3	19	1.48	59	26.94	88	104	.84
4	Sample4	19	1.65	66	24.26	93	111	.83
5	Sample5	23	1.61	67.1	25.9	89	104	.85
6	Sample6	24	1.65	75	27.57	95	123	.77
7	Sample7	21	1.55	57.9	24.12	86	103	.83
8	Sample8	22	1.58	60	24.09	83	99	.83
9	Sample9	21	1.66	65.2	23.7	80	105	.76
10	Sample10	22	1.56	54.3	22.34	82	96	.85
11	Sample11	22	1.61	64.4	24.86	77	100	.77
12	Sample12	20	1.55	55.9	23.29	79	93	.84
13	Sample13	21	1.60	62.8	24.53	85	102	.83
14	Sample14	22	1.56	58.4	24.03	82	97	.84
15	Sample15	19	1.54	57.6	24.3	83	100	.83
16	Sample16	21	1.60	58.7	22.92	92	101	.90
17	Sample17	20	1.66	64.1	23.3	87	106	.82
18	Sample18	22	1.64	66	24.62	81	98	.82
19	Sample19	21	1.62	65.3	24.92	83	98	.84
20	Sample20	23	1.55	60.8	25.33	84	101	.83
21	Sample21	21	1.49	56.6	25.49	70	87	.80
22	Sample22	20	1.61	62.4	24.09	83	97	.85
23	Sample23	22	1.64	63.6	23.73	82	100	.82
24	Sample24	21	1.51	56	24.56	80	91	.87
25	Sample25	21	1.58	60.7	24.37	81	95	.85
26	Sample26	21	1.71	69.9	23.93	89	108	.82
27	Sample27	20	1.54	56	23.62	84	99	.84
28	Sample28	22	1.7	73	25.25	82	98	.83
29	Sample29	20	1.52	51.5	22.29	78	92	.84
30	Sample30	21	1.61	62.2	24.01	76	88	.86

- *BMI: Body Mass Index, WHR: Waist to Hip Ratio.*

Table: 11. Raw data of RHR & EHR Measurement recorded data sheet of the study subjects for Cardiorespiratory endurance (post training).

S.No.	Name of Subjects	Age	RHR (b/m)	Remark	Age	EHR (b/m)	Remark
1	Sample1	20	74		20	104	
2	Sample2	21	77		21	102	
3	Sample3	19	78		19	97	
4	Sample4	19	77		19	97	
5	Sample5	23	75		23	100	
6	Sample6	24	73		24	106	
7	Sample7	21	74		21	107	
8	Sample8	22	73		22	98	
9	Sample9	21	75		21	97	
10	Sample10	22	72		22	108	
11	Sample11	22	78		22	110	
12	Sample12	20	80		20	104	
13	Sample13	21	75		21	108	
14	Sample14	22	77		22	114	
15	Sample15	19	72		19	102	
16	Sample16	21	79		21	107	
17	Sample17	20	81		20	116	
18	Sample18	22	78		22	98	
19	Sample19	21	74		21	116	
20	Sample20	23	80		23	102	
21	Sample21	21	76		21	104	
22	Sample22	20	75		20	94	
23	Sample23	22	73		22	100	
24	Sample24	21	74		21	108	
25	Sample25	21	80		21	106	
26	Sample26	21	80		21	110	
27	Sample27	20	74		20	104	
28	Sample28	22	73		22	105	
29	Sample29	20	72		20	110	
30	Sample30	21	79		21	101	

- *RHR: Resting Heart Rate, EHR: exercise heart rate, b/m: beat per minutes*

APPENDIX- G: Descriptive statistics of all variables of study subjects

Table: 12: Descriptive statistics of exercise heart rate, resting heart rate, body mass index and waist to hip ratio of study subjects

Exercise heart rate test and resting heart rate of Pre-During and Pre-Post Test

	N	Range	Minimum	Maximum	Mean	Std. deviation
Pre HER	30	21.00	99.00	120.00	108.3000	5.87308
During HER	30	21.00	97.00	118.00	106.6333	5.72643
Post HER	30	22.00	94.00	116.00	104.5000	5.67967
Pre RHR	30	10.00	75.00	85.00	79.5667	2.88496
During RHR	30	9.00	74.00	83.00	77.8333	2.81723
Post RHR	30	9.00	72.00	81.00	75.9333	2.81539
Pre BMI	30	4.77	25.00	29.77	26.2813	1.21440
During BMI	30	5.24	24.20	29.44	25.7610	1.26901
Post BMI	30	5.28	22.29	27.57	24.4560	1.10332
Pre WHR	30	.16	.80	.96	.8783	.03553
DuringWHR	30	.18	.78	.96	.8747	.04032
Post WHR	30	.14	.76	.90	.8330	.02973
Valid N (list wise)	30					

EHR=exercise heart rate, RHR=resting heart rate, BMI= body mass index, WHR=waist to hip ratio.

APPENDIX- H: Test protocols/norms

Table: 13 YMCA Step Test Rating Norm for Girls, Based on Age

	18-25	26-35	36-45	46-55	56-65	65+
Excellent	52-81	58-80	51-84	63-91	60-92	70-92
Good	85-93	85-92	89-96	95-101	97-103	96-101
Above Average	96-102	95-101	100-104	104-110	106-111	104-111
Average	104-110	104-110	107-112	113-118	113-118	116-121
Below Average	113-120	113-119	115-120	120-124	119-127	123-126
Poor	122-131	122-129	124-132	126-132	129-135	128-133
Very Poor	135-169	134-171	137-169	137-171	141-174	135-155

Source; http://www.sparkpeople.com/resource/fitness_articles.asp?id=1115

Table: 14. Resting Heart Rate Test Rating Norm for Girls, Based on Age group.

Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	54-60	54-59	54-59	54-60	54-59	54-59
Excellent	61-65	60-64	60-64	61-65	60-64	60-64
Good	66-69	65-68	65-69	66-69	65-68	65-68
Above Average	70-73	69-72	70-73	70-73	69-73	69-72
Average	74-78	73-76	74-78	74-77	74-77	73-76
Below Average	79-84	77-82	79-84	78-83	78-83	77-84
Poor	85+	83+	85+	84+	84+	84+

Source: <http://www.topendsports.com/testing/heart-rate-resting-chart.htm>

Table: 15. Norm of Waist to Hip Ratio (WHR)

Gender	Excellent	Good	Average	At risk
Males	<0.85	0.85-0.89	0.90-0.95	>0.95
Females	<0.75	0.75-0.79	0.80-0.86	>0.86

Source: American college of sport medicine 2010.

Table: 16 Parameters used to test Body weight

Body Mass Index (BMI)

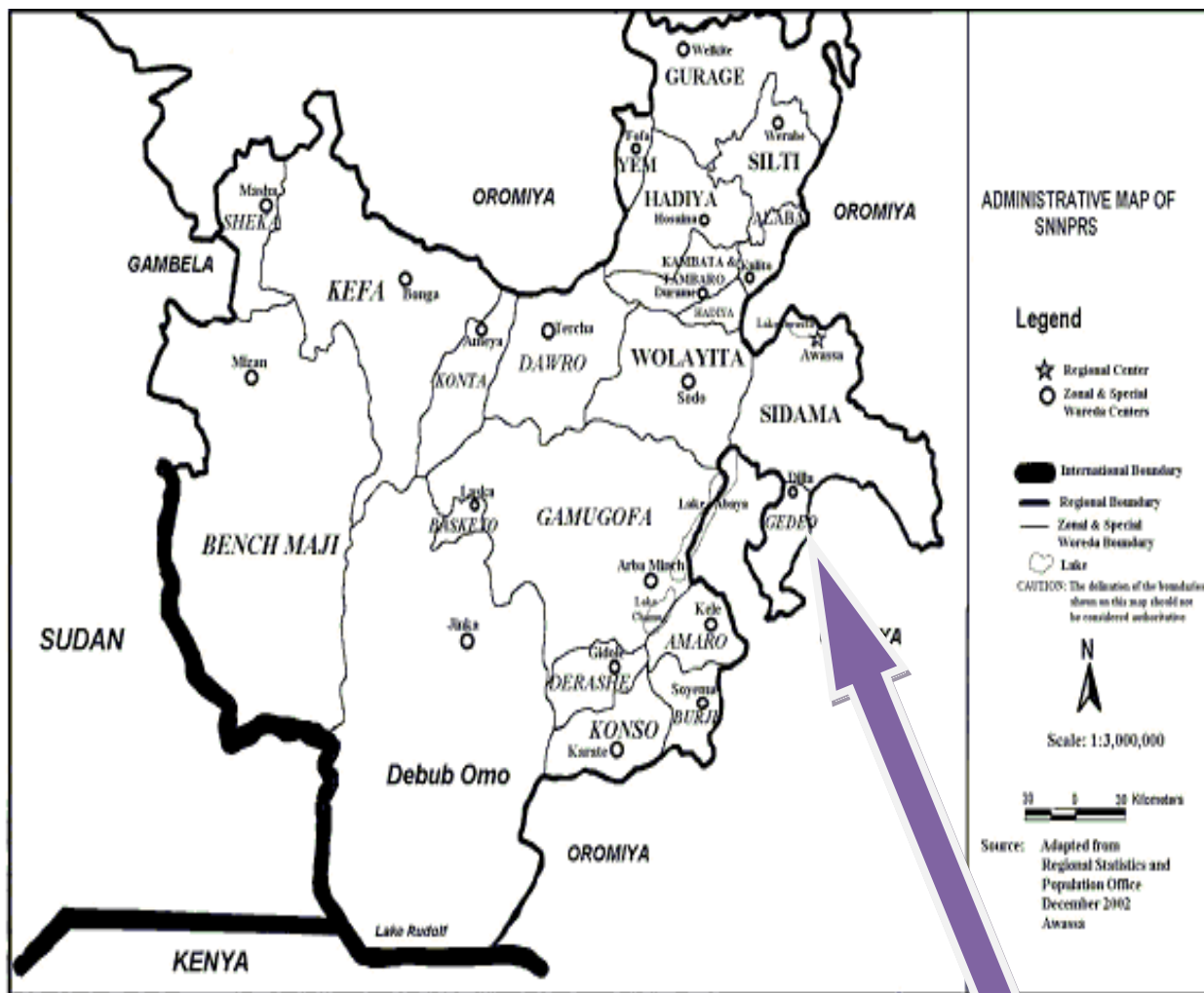
BMI is calculated from body mass (M) and height (H). $BMI = M / (H \times H)$, where M = body mass in kilograms and H = height in meters. The higher the score usually indicates the higher levels of body fat. The table below is used to determine BMI rating of Girls.

Item	Classification
Under weight	Below 18.9
Healthy range	18.9– 24.9
Overweight	24.9 – 29.9
Obese	Above 30

Source: <http://www.topendsports.com/testing/tests/mass.htm>

APPENDIX- I: Figure

Appendix figure1. Map of the study Site



DILLA

Source; <https://www.bing.com/images/searchview>