EFFECT OF 12 WEEKS AEROBIC EXERCISE ON MUSCULAR STRENGTH, MUSCULAR ENDURANCE AND FLEXIBILITY OF MALE STUDENTS OF HARAR JUNIOR SECONDARY SCHOOL, HARAR CITY, HARARI REGIONAL STATE

MSc THESIS

ABDUSEMED AMAN GAMO

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Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Students of Harar Junior Secondary School, Harar city, Harari Regional State

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As thesis research advisors, we hereby certify that we have read and evaluated this thesis entitled: "**Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Students of Harar Junior Secondary School** " prepared by Abdusemed Aman Gamo.We recommend that it can be submitted as fulfilling the thesis requirements.

Dr.Desta Enyew (PhD) _____

_____

Major Advisor Signature Date

Dr.Shemelis Mokonnen (PhD) _____ _____

Co Advisor Signature Date

As member of the Examining Board of the final M Sc. Open Defense, we certify that we have read and evaluated the thesis prepared by Abdusemed Aman Gamo and examined the candidate. We recommend that the thesis can be accepted as fulfilling the thesis requirements for the Degree of: Master of Science in Sport Medicine.

_____ _____ _____

Chairperson Signature Date

_____ _____ _____

Internal Examiner	Signature	Date
_____	_____	_____
External Examiner	Signature	Date

DEDICATION

This work is dedicated to my entire lovely families for helping me with warm care, affection, lovely parenthood and for their immense contribution in the success of my life.

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 a Master of Sport Medicine 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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Name of Author: Abdusemed Aman Gamo

Place: - Haramaya University, Haramaya

Department: Sport Science

Date of Submission: _____

Signature: _____

BIOGRAPHICAL SKETCH

The Author was born in July 23 1992 in West Arsi of Oromia Regional State. He attended his Elementary and Secondary education at Heban Dagaga primary and secondary school and Preparatory at Zuway Donbosco Catholic Church school in Zuway City.

Then, he joined Haramaya University in the Department of Sport Science in 2010 and graduated with Bachelor of Science Degree in Sport Science in 2012.

Upon completion he was employed as Officer of Competition and Participation in Harari Sport Commission in 2013. He served for three years and in 2016 joined Haramaya University to persue his study in the regular program for Master of sport science in Sport Medicine.

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ACRONYMS AND ABBREVIATIONS

BMI	Body Mass Index
Bpm	Beats Per Minute
CRD	Complete Randomize Design
DTT	During, Training Test
HRmax	Maximal Heart Rate
HSPC	Harari Sport Commission
PoT	Post Test
PT	Pre Test
SPSS	Statistical Packages for Social Sciences
SR	Sit and Reach
SRT	Sit and Reach Test
SU	Sit Up

THR	Target Heart Rate
WHO	World Health Organization

Table of Contents

Table of Contents(continued)

Table of Contents (continued)

LIST OF TABLES

Tables

Page

LIST OF FIGURES

F i g u r e s

Page

LIST OF TABLES IN THE APPENDIX

T a b l e s

Page

LIST OF FIGURES IN THE APPENDIX

F i g u r e s

Page

Effect of 12 Weeks Aerobic Exercise on Muscular Strength, Muscular Endurance and Flexibility of Male Students of Harar Junior Secondary School, Harar City, Harari Regional State.

ABSTRACT

The study was conducted to investigate the Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Students of Harar Junior Secondary School, Harar city, Harari Regional State. In this school there were students as the study population From 398 male students only forty male students were selected as study subjects by using simple random sampling techniques. All Selected subjects were participated in low,

moderate and high intensity in selected aerobics exercise for 12 consecutive weeks that is 4 days per week 60 minute duration per day. Pre, during and post training tests were conducted on the selected physical fitness variables such as muscular endurance, muscular strength, and flexibility. The data collected from the study subject were analyzed using SPSS version 20 software. The data pertaining to those selected physical fitness variables were analyzed by paired sample 't' test to determine the significant difference between initial and final mean for participant. According to analyzed data in push up 8.37 mean differences was recorded. The mean difference value boosted in sit up performance by 4.70 after putting the subjects for 12 weeks on selected physical exercises. In sit and reach test 4.17 increments were observed. The result obtained in this study indicated that there were significant improvements in muscular endurance, muscular strength and flexibility. Based on this finding, it can be concluded that low, moderate and high intensity aerobics exercise has positive effect on enhancement of muscular endurance, strength and flexibility of students of Harar Junior Secondary School.

***Key words**: Aerobics Exercise, Muscular Endurance, Muscular strength, Flexibility,*

1. INTRODUCTION

This chapter describes background of the study, statement of the problem, scope of the study, significance of the study, and objectives of the study

1.1. Background of the Study

Regular physical activity, fitness, and exercise are critically important for the health and wellbeing of people of all, whether they participate in vigorous exercise or some type of moderate health-enhancing physical activity. Even among frail and very old adults, mobility and functioning can be improved through physical activity (Butler ., 1998).

Life will not be life without physical activities. The story of evolution throws some light on the nature and types of activities which are an essential part of modern physical activities which are to be fit for day-to-day existence and to meet the occasional emergencies that arise. Whatever may the emergency that trust itself on individuals the human beings have to readjust and carry on (M. Vijayaragavan, 2010).

The negative effects of degraded physical fitness on both the individual and society are serious and multi-dimensional. It can cause many risk factors to health including coronary heart disease, certain forms of cancer, diabetes, hypertension, stroke, gall bladder diseases, osteoarthritis, and respiratory problems and is associated with increases in all cause mortality (Cataldo, 1999).

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

Physical fitness refers to the organic capacity of the individual to perform the normal task of daily living without undue tiredness or fatigue having reserve of strength and energy available to meet

satisfactorily any emergency demands suddenly placed upon him. Physical fitness is a state of well-being that comprises skill related and health-related components; the health-related aspect is a measure of cardiovascular endurance, muscle strength, endurance, and flexibility, and body composition (Hopkins & Walker, 1988).

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 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. All activities involve the co-ordinate interaction of many body systems the muscular system and the skeletal system interact to produce movement, the contracting muscles exert a force or full on the bones , resulting in movement at the joints. Muscle contraction requires energy, which is supplied by nutrients from the digestive system and oxygen from the respiratory system (Rosser, 2001).

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 and conditions including disabilities with a wide range of physical, social and mental health benefits. Physical activity interacts positively strategies to improve diet, discourage the use of tobacco alcohol and drugs, helps reduce violence, enhances functional capacity and promotes social interaction and integration. (WHO 2003)

Now a days in our country Ethiopia, most people are attacked by chronic disease such as; coronary heart disease, hypertension, diabetes, and some other upcoming diseases. This is caused by lack of awareness and their attitude towards the benefits of regular physical exercise for their health. According to many research studies finding physical inactivity is one of the causes for development of chronic disease and poor fitness. Similarly, in harar people are living due to poor culture of having regular physical exercise. That was the reason to conduct the research in this place. The research investigated the Effect of 12 Weeks Aerobic Exercise on muscular strength,

muscular endurance and flexibility of male students of harar junior secondary school, harar city, harari regional state.

1.2. Statement of the Problem

Selected types of exercises are important for the development and maintenance of health and performance. In fact, numerous studies have examined the effect of aerobic exercise training on physical and mental health (Heller T. et al., 2011).However; there was no enough research that studied the effect of selected physical trainings on muscular strength, muscular endurance and flexibility on male students of Harar Junior secondery school.

Therefore the investigator of this study tried to answer the following research questions.

1. Does Aerobic exercise have effect on muscular endurance among male students?
2. Is an Aerobic exercise significant on muscular strength among male students?
3. Does Aerobic exercise have effect on flexibility among male student?

3.3. Scope of the Study

The Scope of this study was located at eastern Ethiopia which is 512km far from the capital city, Addis Ababa .This study were restrict only on Effect of 12 Weeks Aerobic Exercise on muscular strength, muscular endurance and flexibility of male student of harar junior secondary school.

3.4. Significance of the Study

The main aim of this study was to analyze or investigate the Effect of 12 Weeks Aerobic Exercise on muscular strength, muscular endurance and flexibility of male student of harar junior secondary school, harar city, harari regional state., but it does not mean that the outcome of this research is only restricted to Harar ;it also helps other male community as well as Harari area male student residential to understand the effect of aerobic exercise training in enhancing their some selected health related physical fitness components such as, muscular endurance ,muscular strength and flexibility

In addition to this the study has the following importance points.

- This study was helpful to concerned bodies to know about the effects of aerobic exercises on the enhancement of muscular endurance, strength and flexibility performance
- It was also helpful to other researchers for further studies on the problem.

3.5. Objectives of the Study

3.5.1. General objective

The General objective of this study was to investigate the Effect of 12 Weeks Aerobic Exercise on muscular strength, muscular endurance and flexibility of male student of Harar junior secondary school,

3.5.2. Specific objectives

- To evaluate effects of Aerobic exercise on improvements of muscular endurance of male students.
- To examine the significance of aerobic exercise on muscular strength of male students
- To examine the effect of aerobic exercise on flexibility of male students.

2. REVIEW OF RELATED LITERATURE

This chapter dealt with about definition of health, aerobic exercise and its benefits, physical fitness and its benefits, health related physical fitness, health related physical fitness test, characteristics of exercise intensity and measurement of exercise intensity

2.1. Definition of Health

Most people think they are healthy, just because they are not sick. Not being sick is not a good indicator of being that healthy. The World Health Organization (WHO) has defined health as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (Schriver 1996). Health is also seen as optimal well-being that contributes to quality of life. It is more than freedom from disease and illness, though freedom from disease is important to good health. Optimal health is said to include high-level mental, social, emotional, spiritual and physical wellness within the limits of one's heredity and personal abilities. (Corbin and Lindsey, 1997).

Health benefits of physical activity depend on the frequency, intensity and duration of (volume)of physical activity (Belardinelli *et al*., 1999; Dunn *et al*., 1999; Bouchard 2001; Tanasescu *et al*.,2002; Rognmo *et al*., 2004).

To be healthy, a person should not only be physically fit, but emotionally, mentally sound, as well as socially acceptable. A physically well-built person with a lot of problems to think about or under stress could not be a healthy person. To be healthy, a person should have all three components of health as indicated by the definition of WHO. The absence of one factor does not make a person healthy.

According to Hahn (2003), "Health is the ability to access and apply resources from the six dimensions of health to the experiences of daily living, thus assuring growth and development and the sense of well-being that it affords". The six dimensions of health are physical, emotional,

social, intellectual, spiritual and occupational dimensions. This definition, like the first ones, does not mention the absence of disease as an indication of being healthy, but confirms the fact that health is a composite situation. It also indicates that health is not static; it could change in the next moment, positively or negatively.

Wellness is seen as the vehicle by which one's potential to live and work effectively and to make a significant contribution to society could be expanded (Fahey 2003). Chaudhary (1998) studied the difference in physical fitness of urban and rural students studying in class IX and X and found that rural students were better in physical fitness than urban students. Uppal and Sareen,(2000) conducted a study to find out the comparison on cardio vascular fitness between rural and urban students and revealed that students with rural background performed better than that of their counterparts in urban area.

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. The aerobics exercise is a system of acyclic exercises, which improves the capacity of cardiovascular functions, develops the toughness of muscles and the coordination of movement (Vitartaitė *et al*., 2004).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.newellness.com).

2.2.2. Benefits of aerobic exercise

Exercise can reduce the risk of premature death, reduce or maintain body weight or body fat, reduce the risk of developing diabetes, high blood pressure, boost the immune system, strengthen

heart and lung slow the aging process, burn calories, reduce resting heart rate, improves confidence and so on The benefits of aerobic exercise are myriad. They include systemic changes such as reduced cholesterol and blood pressure, improved muscular endurance, reduced body fat, increased metabolism, to name a few. The finding of the study shows that aerobic training is more beneficial and can be used as a preventive measure in patients who are at risk of developing cardiovascular diseases due to obesity (Chaudhary *et al*., 2010).Aerobic activities strengthen the heart and lungs, making them more efficient and durable, improving quality and quantity of life. Exercise not only extends your 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)

2.3. Physical fitness and its benefit

2.3.1. Physical fitness

Physical fitness is a set of attributes that people have or achieve. Being physically fit has been 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 emergences. (Gutin, 1980). Fitness is defined as a condition in which an individual has enough energy to avoid fatigue and enjoy life.

2.4. Health Related Physical Fitness

Health-Related Physical Fitness is the portion of physical fitness directed toward the prevention of or rehabilitation from disease, the development of a high level of functional capacity for the necessary and discretionary tasks of life, and the maintenance or enhancement of physiological functions in biological systems that are not involved in performance but are influenced by habitual

activity. Maintaining an appropriate level of health related fitness allows a person to meet emerge, reduce the risk of disease and injury, work efficiently, participate and enjoy physical activity (sports, recreation, leisure);and Look one's physical best . (Polwman, 2011) Kruk, 2007.conducted the study in Poland that showed that engaging in moderate physical activity is very important for the primary prevention of chronic diseases, decreasing all causes of mortality and that exercise is one of the determinants for physical and psychological well-being.

2.4.1. Muscular Strength

Muscular strength refers to the maximum amount of force a muscle can exert against an opposing force. Fitness testing usually consists of a one-time maximum lift using weights, bench press, leg press, etc. Muscular strength and performance have direct relationship. According to the research, result conducted on the skeletal muscle mass and muscle strength in relation to lower extremity performance of older men and women suggest that low muscle strength, but not low muscle mass, is associated with poor physical function (Paul 2000). Strength is seen as an equally important aspect of health-related fitness and refers to the maximum tension or force muscles develop in a single contraction against a given resistance. Wuest and Lombardo (1994)

2.4.2. Muscular Endurance

Muscular Endurance is the ability to perform repeated contractions against a sub-maximal resistance (Anderson et al., 1995). The ability of the muscle to exert a sub-maximal force against resistance repeatedly or to sustain muscular contraction continuously over time is characterized by activities of long duration but low intensity (Robbins 1997).Corbin (2003) define muscular endurance as the maximum number of repetitions or muscle contractions one can perform against a given resistance. Muscular endurance refers to the ability of the muscle to work over an extended period of time without fatigue. Performing pushups and sit-ups or curl up for one minute is commonly used in fitness testing of muscular endurance. In training setting muscular strength and muscular endurance can go in line. According to the research conducted on the

effects of strength training on endurance capacity of top-level endurance athletes, strength training can lead to enhanced long-term (>30 min) and short-term (>15 min) endurance capacity both in well-trained individuals and highly trained top-level endurance athletes, especially when high volume, heavy-resistance strength training protocols are applied (Aagaard and Andersen,2001

2.4.3. Flexibility

Flexibility is the measurement of the achievable distance between the flexed position and the extended position of a particular joint or muscle group. This measurement depends on the length and looseness of the muscles and ligaments due to normal human variation and the shape of the bones and cartilage that make up the joint (Chek, 2002).

Wuest and Lombardo (1994) have defined flexibility as the ability of the various joints of the body to move through their full range of motion. Insel (2001) refer to flexibility as the ability to move the joints through their full range of motion. To them flexibility is not a significant factor in the everyday activity of most people, but inactivity causes the joints to become stiffer with age, causing poor posture, back, shoulder and neck pains. Prentice (1997), has defined flexibility as the ability to move freely throughout a full, non-restricted, pain-free range of motion about a joint or series of joints. It is interesting to know that there is no ideal standard for flexibility. There is little scientific evidence to show that a person who can reach 2 inches past his or her toes on a sit-and-reach test is less fit than the person who is able to reach 6 inches past his or her toe. Too much flexibility as well as too little flexibility could be detrimental (Corbin et al., 2003).To develop flexibility, it is recommended that muscles are stretched past normal length until resistance is felt. For duration, the stretch should be held from 5 to 10 seconds initially, building to 30 to 45 seconds (Wuest et al., 1994).

The importance of flexibility to health, good posture and physical performance is even appreciated by animals like the cat and the dog that stretch after sleeping to maintain good joint mobility. Every person needs some flexibility to perform efficiently and effectively in daily life. Body builders, who have developed bulged muscles through improper weight-training, usually sacrifice flexibility in order to develop muscle strength. In strength training, it is important to

ensure that all movements are carried through their full range of motion to satisfy the good thumb rule; “ stretch what you strengthen and strengthen what you stretch ”(Scott, 2002).

2.5. Health Related Physical Fitness Test

2.5.1. Test for muscular strength

Push up test: The push-up test is a basic fitness test used by coaches, trainers and athletes to assess upper body fitness and to monitor progress during strength and fitness training. This test helps you compare your own upper body muscular endurance to others of your age and gender, and track your fitness program over time (sports medicine.about.com). Men should use the standard "military style" pushup position with only the hands and the toes touching the floor. Do as many pushups as possible until exhaustion. Count the total number of pushups performed The average number of pushups for men is 19-34 for the age 17-19, 17-29 for the age 20-29, 13-24 for the age 30-39, 11-20 for the age 40-49, 9-17 for the age 50-59, 6-16 for the age 60-65 (Golding et al., 1986).

2.5.2 Test for muscular endurance

Sit up Test: The objective of this test is to measure abdominal muscular strength and endurance of the abdominals and hip-flexors, important in back support and core stability. For this test Subjects lays on her back on the mat with knee bent and feet about two feet apart. Her hands are placed on the back of the neck with the fingers interlocked. Elbows are retracted. Assistance data collector holds the subject ankles down, the heels being in contact with the mat at all times. The subject sits up, turning the trunk to the left and touching the right elbow to the left knee, returns to starting position, and then sits up turning the trunk to the right and touching the left elbow to the right knee. The maximum number of sit ups done within 30 seconds will be taken as her score. The average sit ups for is 29-39 for the age 18-25, 25-28 for the age 26-35, 19-22 for the age 36-35,14-17 for the age 46-55,10-12 for the age 56-65, 11-13 for the age 65+. (Golding et al., 1986).

2.5.3 Test for flexibility

Sit and reach test: This test measures the flexibility of the lower back and hamstring muscles. It involves sitting on the floor with legs out straight ahead. Feet(shoes are placed with the soles flat against the box, shoulder-width apart. Both knees are held flat against the sit and reach apparatus by the tester. With hands on top of each other and palms facing down, the subject reaches forward along the measuring line as far as possible. After three practice reaches, the fourth reach is held for at least two seconds while the distance is recorded. Make sure there is no jerky movements and that the fingertips remain level and the legs flat. The score is recorded to the nearest centimeter as the distance before (negative) or beyond (positive) the toes. The average score for boys is between +0 to +5cm (Wells and Dillon,1952)

2.6. Characteristics of Exercise Intensity

Exercise intensity refers to how hard your body is working during physical activity. Your health and fitness goals, as well as your current level of fitness, will determine your ideal exercise intensity. The goal is work hard, but not too hard. Typically, exercise intensity is described as low, moderate, or vigorous. For maximum health benefits, the goal is to work hard, but not too hard, described as moderate-intensity by the (National Physical Activity Guidelines for Australians). These guidelines recommend that for good health, you should aim for at least 30 minutes of moderate-intensity physical activity on most days. This is the same for women and men (http://www.betterhealth, 2013). The process of determining and controlling appropriate exercise intensity presents a challenge, which has implications related to both physiological changes and to individual compliance within an exercise program (K and EPLM 2001).

Several measurements for gauging exercise intensity for various exercise modalities have been devised and applied. These include proportion of maximal oxygen uptake (%VO2 max), proportion of maximal heart rate (%HRmax), proportion of maximal heart rate reserve (%HRRmax), and blood lactate indices

2.7. Measurement of Exercise Intensity

There are varying ways to measure your exercise intensity to make sure your body is getting the most out of every workout. You may need to experiment to find out which method of measuring exercise intensity suits you best. Three different measurement methods include: - Target heart rate, Talk test, and Exertion rating scale (http://www.betterhealth, 2013)

2.7.1. Measuring exercise intensity using target heart rate

The human body has an in-built system to measure its exercise intensity – the heart. Your heart rate will increase in proportion to the intensity of your exercise. You can track and guide your exercise intensity by calculating your Target Heart Rate (THR) range.

The ranges of exercise intensity

- Low (light) is about 40-54%MaxHR
- Moderate is 55-69%
- High (vigorous) is ≥ 70%

For moderate-intensity physical activity, a person's THR should be 50 to 70 per cent of their maximum heart rate. The maximum 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 (bpm) minus your age. Because it is an estimate, use it with caution. Keep your heart rate at the lower end of your recommended range if you are just starting regular exercise. Gradually increase the intensity of your workouts as your fitness improves. Also, your heart rate should stay in the lower ranges during warm-up and cool down periods. Using a heart rate monitor is an easy way to keep track of your heart rate while you're exercising, or you can take your pulse.(American College of Cardiology).

3. MATERIALS AND METHODS

This chapter dealt with description of the study area, experimental materials, source of data, study design, sampling size and technique, data collection instrument, fitness test analysis, method of data analysis, data quality control and protocols and ethical consideration.

3.1. Description of the Study Area

Geographically the study area is located approximately 526 km from Addis Ababa Specifically; it is found in Harari region in Harar town. The fortified historic town of Harar located in eastern part of the country on a plateau with deep gorges surrounded by dessert and savannah. The walls of surrounding of this Muslim city were built between the 13^{th} and 16^{th} centuries. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), Harari has a total population of 183,415, of whom 92,316 are men and 91,099 women. The ethnic group in the

region includes Oromo (56.4%) Amara (22.77%) Harari (7.61%) Gurage (4.34%) Somali (3.87%) Tigray (1.53%) Argoba (1.26%) other (1.17%).This region is the only one in Ethiopia where the majority of its population lives in urban area: 99,368 or 54.18% of the population are urban inhabitants. With an estimated area of 311.25 square kilometers this region has an estimated density of 589.05 people per square kilometer. Position of the earth surface of the region Latitude 91849”N, Longitude 42705E and elevation above sea level 1917m or 6289ft.The annual Temperature is 19.4C and rain fall in average 723mm.For the entire region 46,169 households were counted, which results in an average for the Region of 3.9 persons to a household, with urban households having on average 3.4 and rural households 4.6 the research was conducted in Harar junior secondary school. The school was established in 1961.The School is located in front of Harar Imam Ahmed Stadium in Hakim woreda kebele 17.

Source (2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA) Map of the study site is indicated on page 55

3.2. Experimental Materials

The following materials were used through the process of the study. These materials were exercise mats, marking cones, stopwatch, meter and whistle were used during training as well as in the tests.

3.3. Source of Data

For this study primary data were used. The primary data were obtained from experimental variables according to designed parameters .secondary data were used from different sources like, books, journals, and internet.

3.4. Study Design

This study was carried out for three consecutive months. In the beginning of the first month pretests were taken and at the beginning of the second month the second tests were taken and

also at the end of the 3rd month post-tests were administered. For this study from 398 male students 40 students with age of 16-18 years old were selected from grade 9 and 10 Harar junior Secondary School. In this study the simple randomize design (SRD) was applied. The pre, during and post-test on selected health-related physical fitness parameters were administered for the selected subject. The participants were engaged in design program for twelve weeks such as, sit and rich, push up and sit up. Including warming up ,static stretching exercise, rope jumping, triceps on stairs, circuit training, walking, jogging, running, floor exercise and cooling down exercise with low, moderate and high intensity for four days per week (Monday, Wednesday, Friday and Saturday), for 60min per day for three months.

3.5. Sampling Size and Techniques

For the present investigation simple random sampling techniques were used to specify the study subjects. The sample size was containing a total of 40 male students with age 16-18 years old for experiment from 398 or 10 percent of total population.

3.5.1. Inclusion and Exclusion Criteria

Male Subjects who fulfill the health history questionnaire and whose age is 16-18 years old will be part of the study. The subjects who have any recent physical injury and medical problems and also whose age is less than 16 and above 18 years old will not be part of the study.

3.6. Data Collection Instrument

Stop watch, whistle, meter, pen, and paper, wooden blocks, mats, were used as instruments for the training as well as to collect the data during the tests.

3.7. Fitness Test Analysis

The American Alliance for Health, Physical Education, Recreation and Dance youth fitness test were selected for the purpose of developing norms. A parameter of health related physical fitness variables were recorded especially for pretest, during test and post test.

3.7.1. Sit up test

The participants were asked to take starting position by laying on their backs with knee bent, feet and back flat on the floor, with the heels approximately 12-18 inches from the buttocks. Arms were interlocked behind the head. On the command ‘‘ready go’’ the subjects sit ups in sitting position until the elbows contacted the knees, the returns back to the floor and continues to perform as many sit ups as possible in one minute. The completion of one complete sit ups (up and back) were counted as one. The scoring system which followed for this test was the total number of complete sit ups in 60 second.

3.7.2. Push up test

These activities were done in its basic form and measures muscular strength. Before starting this test the participants performed warming up and stretching exercises. The subjects being tested on prone lying position putting their palms at the shoulder level on the ground, face-down on the mat. On the signal “go” they were asked to raise their body upward until the arms were fully extended, then lowered until the elbows were bent at 90 degrees. The total number of pushups per minute was recorded as their score.

3.7.3. Sit and reach test

The participants were perform warming up activities and some stretching activities for 5 minutes before starting test. For this test the participants removed their shoes and sit on the floor with legs stretched out straight ahead. The soles of the feet were placed flat against the sit and reach box. Both knees were locked and pressed flat to the floor, the tester assisted by holding them down

with the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. Three times trail were permitted to the subject and the best one from three trials was taken as his score. The subjects reached out and hold that position for a one-two seconds while the distance was recorded.

3.8. Method of Data Analysis

The Researcher analyzed and interpreted data by comparing pre, during and post test results by t-test on computerized statistical packages software system (SPSS) version 20.The level of significant were 0.05%.

3.9. Data Quality Control

Data were collected by the researcher and one assistant teacher from the Scholl .To avoid errors training has been given for the assistance data collector on how to use data collecting

Instruments and measurements during data collection. Only standardized materials were used to keep the quality of the data. Additionally, all the mentioned tests were recorded with photograph. Finally, the data had been coded and fed to software twice, with different persons to avoid error in data feeding.

3.10. Protocols and Ethical Consideration

This study was conducted in line with the rules, policies and research ethics of Haramaya University. The privacy of the participants was protected. Participants were informed earlier with written letter. The ethical clearance protocols were approved by the Institutional Research Ethics Review Committee (IRERC) of the Haramaya University

4. RESULTS AND DISCUSSIONS

4.1. Overview

This chapter deals with the analysis of data collected from the sample under study. The purpose of this study was to investigate the effect of "Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Students of Harar Junior Secondary School,. Forty subjects were selected from 398 male students. The participants were engaged in designed exercise program for twelve weeks for 60 minutes, the subjects were engaged in exercise 4 days in a week. In this study, field tests were taken three times at Pre, during and Post exercise. Under this, three variables such as muscular strength, endurance and flexibility had been evaluated by push up, sit up and sit and reach test as well as the results of those variables are discussed as follows:-

4.2. Demographic Characteristics of the Study Participants

A total of 40 male students were selected for the study subjects. From the total number of the study subjects no one was lost. 100% of the study subjects followed the training program properly from initial till end.

4.3. Effect of selected Aerobics Exercises on Muscular strength

Table 1: Mean values of push up results in PT,DTT and PoT

Test	N	PT	DTT	PoT	Sig	T-value
Push up	40	19.65 ±7.73	23.95 ±7.99	28.02 ±8.04	.00	-28.22

Values are mean ± standard deviation, PT= pre Training test which was taken before training, DTT= During Training test which was taken at the end of sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

The data (table 1) showed that there was significant difference in-between the pre, during and post test result. The improvement in performance was due to the aerobics exercises in which they were engaged in designed training program. The mean score value for push up test before aerobic exercise was 19.65,the subjects were scoring good fitness (according to norm) during training test was 23.95, which means they scored good fitness (according to norm) and after training mean score value was 28.02, again the subject were scored good fitness according to norm. When we compare the mean value score of before training test with the mean score values of after 12 weeks aerobic exercise training program, the mean difference value increased by 8.37. This result indicated the effective change was observed on participants' Muscular endurance.

Miller (1994) has postulated that muscular endurance is important in our daily activities such as walking, working, and playing which involves muscular contraction and relaxation, and that people who possess good muscular endurance are said to have a greater working capacity

Figure 1Mean values of push up results in PT,DTT and PoT

The above figure 1 showed that there was significant difference in-between the pre, during and post test result. The improvement in performance was due to the aerobics exercises in which they were engaged in designed training program.

Table 2: Comparison of Subjects Result with Norm of Push up Test for Muscular Endurance

Rating	Good	Average	Below average	poor	N(100%)
Push up Test	Performance				

PT	1(2.5%)	18(45%)	15(37.5%)	6(15%)	40(100%)
DTT	5(12.5%)	22(50%)	12(30%)	1(2.5%)	40(100%)
PoT	10(25%)	26(65%)	4(10%)	0(0%)	40(100%)

N= 40 subjects PT= Pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

From the presented data on the above table 4 there were significant change observed on the subjects of muscular strength and enhancement of push up performance due to well-designed aerobics exercise program for twelve weeks, four times per week for 60 minutes duration of exercise. The results obtained from the subjects at pre training test, 6(15%),15(37.5%),15(15%),18(45%)1(2.5%)and 0(0%)of them scored poor, below average, average, above average, good and excellent respectively. During training of test, 1(2.5%),12(30%)22,(50%),5(12.5%)), and 0(0%) of them were scoring poor, below average, average, above average good and excellent. At Post training of test 0(0%) 4(10%), 26(65%), 10(25%)), 10(25%), and 0(0%) of them scored poor, below average, average, above average and excellent accordingly. This result shows that significant changes were achieved on the study participant at pre, during, and post training test according to the norm (Appendix F, on table 8).

4.4. Effect of selected Aerobics Exercises on flexibility

Table 3: Mean values of sit and reach results in PT, DTT and PoT(cm)

Test Item	N	PT	DTT	Pot	Sign	t-value
SR	40	8.35±3.67	10.40±3.60	12.52±3.59	.00*	20.64

Values are mean ± standard deviation, SR= sit and reach test PT= pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

The above table showed that there was significance differences before the exercise and after 12 weeks of aerobics exercise on the subjects sit and reach performance. The mean values of sit and reach were 8.35 in before selected aerobics exercise, that means they scored average (according to the norm), which was improved to 10.40 in during test here is also the trainees were the average (according to the norm) and improved by 12.52 after 12 week physical exercise test (they scored above average according to the norm in the appendix F on table 8); these means the sit and reach performance improved by 4.17 after 12 weeks of aerobics exercise. The main reason for these improvements was due to selected physical exercises in which the subjects (they) took at the field. All these activities involved vigorous movement of the joints of the body. This result was supported by previous findings of Miller (1994), that active people are more flexible than inactive individuals.

The inability to stretch far forward indicates tightness in the low back and hamstrings due to inactivity (Lidell, 1997). This finding agreed with the finding of 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.

However, the improvement of the rate of this data was one indicator of the enhancement of the participant's range of motion in the joints (flexibility). The reason behind this change was aerobics exercise that they were participating in well-designed training program.

Table 4: Comparison of Subjects Results with Norm of Sit and Reach Test for Flexibility

Rating	Excellent	Above average	Average	Below average	Poor	N(100%)
SRT						
PT	1(2.5%)	12(30%)	14(35%)	6(15%)	7(17.5%)	40(100%)
DTT	6(15%)	15(37.5%)	12(30%)	7(17.5%)	0(0%)	40(100%)
PoT	15(37.5%)	12(30%)	11(27.5%)	2(5%)	0(0%)	40(100%)

N= 40 Subjects, SRT= Sit and Reach Test PT= Pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

From the presented statistics on the above table 6, there was a significant difference observed in between before, during and after 12 weeks of aerobics exercise training program on the study participant of flexibility and sit and reach performance. As the results were taking from the subjects at pre training test was 1(2.5%), 12(30%), 14(35%), 6(15%), 7(17.5%) of them scored excellent, above average, average, below average, and poor respectively. At during test training test was 6(15%), 15(37.5%), 12(30%), 7(17.5%), and 0(0%) of the subjects (study participants) were scoring excellent, above average, average, below average and poor accordingly. At post of training test was 15(37.5%), 12(30%), 11(27.5%), 2(5%) and 0(0%) of the subjects were scoring excellent, above average, average, below average and poor respectively. When we compare the result that was presented on the above table, with the norm of sit and reach for flexibility there was a significant difference in between pre and post training of test

Figure 2Mean values of sit and reach results in PT, DTT and PoT(cm)

The above figure 2, showed that there was significance differences before the exercise and after 12 weeks of aerobics exercise on the subjects sit and reach performance

4.5. Effect of selected Aerobics Exercises on muscular endurance.

Table 5: Mean values of sit up results in PT,DTT and PoT (cm)

Test	N	PT	DTT	PoT	Sign	T-value
Su	40	17.10±7.12	20.12± 7.81	22.65±7.64	.00*	16.62

Values are mean ± standard deviation, Su= sit up PT= pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

The above table showed that there was significance differences before the exercise and after 12 weeks of aerobics exercise on the subjects sit up performance. The mean values of sit up were 17.10 in before aerobics exercise, that means they scored below average (according to the norm), which was improved to 20.12 in during test here is also the trainees were the average (according to the norm) and improved by 22.65 after 12 week aerobics exercise test

Table 6: Comparison of Subjects Results with Norm of Sit up for muscular endurance

Rating SU	Excellent	Above average	Average	Below average	poor	N (100%)
PT	0(0%)	5(12.5%)	9(22.5%)	17(42.5%)	9(22.5%)	
DTT	2(5%)	6(15%)	11(27.5%)	3(7.5%)	8(20%)	
PoT	5(12.5%)	11(27.5%)	16(40%)	2(5%)	6(15%)	

N= 40 Subjects SU= Sit up PT= Pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

From the presented statistics on the above table 6, there was a significant difference observed in between before, during and after 12 weeks of aerobics exercise program on the study participant of muscular endurance and sit up performance. As the results were taking from the subjects at pre training test was 0(0%), 5(12.5%), 9(22.5%), 17(42.5%), 9(22.5%) of them scored excellent, above average, average, below average, and poor respectively. At during test training test was 2(5%), 6(15%), 11(27.5%), 3(7.5%), and 8(20%) of the subjects (study participants) were scoring excellent, above average, average, below average and poor accordingly. At post of training test was 5(12.5%), 11(27.5%), 16(40%), 2(5%) and 6(15%) of the subjects were scoring excellent, above average, average, below average and poor respectively. When we compare the

result that was presented on the above table, with the norm of sit up for muscular endurance (Appendix F, on table 8), there was significant difference in between pre and post training of test.

Figure 3Mean values of sit up results in PT,DTT and PoT (cm)

From the presented statistics on the above figure 3, there was a significant difference observed in between before, during and after 12 weeks of aerobics exercise program on the study participant of muscular endurance and sit up performance.

4.6. Effect of Selected Aerobics Exercises on Muscular Endurance, Strength and Flexibility

Table 7: The mean difference values and significance level of each test results of participants

Dependent variable	Parameter(A)	Parameter(B)	MD(A-B)	Sig
Push up	Post test(28.02)	Pre test(19.65)	8.37	0.00
		During test(23.95)	4.07	0.00
Sit and reach	Post test(12.52)	Pre test(8.35)	4.17	0.00
		During test(10.4)	2.12	0.00
Sit up	Post test(22.65)	Pre test(17.10)	5.55	0.00
		During test(20.12)	3.02	0.00

Values are mean ± standard deviation, SR= sit and reach test PT= pre Training test which was taken before training, DTT= During Training test which was taken at the sixth week of training, PoT= Post Training test measured after putting the study group for 12 weeks training program

Table 7 shows the mean difference in between before training test to during training test results and from before training to after training test results and significance of after training test results in reference to before training test results for participants. Statistically significant changes were seen in push up, sit up, and sit and reach performance of the study participants. Meanwhile, the finding of this study showed that 12 weeks of selected physical exercise had significant effects on muscular endurance, muscular strength and flexibility of students. This was because, the researcher selected different types of aerobics exercise which he provided for the athletes in 12 weeks of training programs. In 12 weeks of training the athletes performed each selected aerobics

exercises 4 times in the same interval and conditions with only changed intensity from low-moderate-high intensity after the first 4 weeks of training, intensity changed from low to moderate and after another 4 weeks of training intensity changed from moderate to high. These selected aerobics exercise trainings were flexibility exercises, strength training, such as push up, sit up, dumbbell, trunk lift, parallel dips, triceps dips on stair/chair and circuit training, up step (step exercises) and rope Jumping . This is supported by (ACSM, 1998) the combination of frequency, intensity, and duration of chronic exercise has been found to be effective for producing a training effect. The interaction of these factors provides the overload stimulus. In general, the lower the stimulus the lower the training effect, and the greater the stimulus the greater the effect. As a result of specificity of training and the need for maintaining muscular strength and endurance, and flexibility of the major muscle groups, a well-rounded training program including aerobic and resistance training, and flexibility exercises is recommended.

A study on health outcomes and Physical activity in children (HOPC) at McMaster University found that children who are more physically active have higher fitness levels. Fitness increases when children spend more time in moderate to vigorous physical activity (activity that makes the heart beat faster).

The study indicates that aerobic exercise is crucial to enhance participants' muscular endurance, strength and flexibility performance. This investigation was supported by many studies. (ACSM, 1990) Resistance training should be an integral part of an adult fitness program and of a sufficient intensity to enhance strength, muscular endurance, and Flexibility exercises should be incorporated into the overall fitness program sufficient to develop and maintain range of motion.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The purpose of this study was to the Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Student of Harar Junior Secondary School,Harar city, Harari Regional State. To achieve the aim of the study 40 male trainees were selected as a subject from 398 male students of harar junior secondary school. Among the existing students 10 percent were included for these study subjects, to specify the study subjects' simple random sampling techniques were used. And the study subjects engaged in to well design physical exercise training program for 12 weeks, four times per week with 60 minute duration in low, moderate and high intensity of exercise. Each session was divided again in to warming up, main part and cooling down phase. The researcher selected different types of physical exercise which he provided for the athletes in 12 weeks of training programs. In 12 weeks of training the athletes performed each selected physical exercises 3 times in the same interval and conditions with only changed intensity from low-moderate-high intensity after the first 4 weeks of training intensity changed from low to moderate and after another 4 weeks of training intensity changed from moderate to high. These selected physical exercise trainings were flexibility exercises, strength training, such as push up, sit up, dumbbell, trunk lift, parallel dips, triceps dips on stair/chair and circuit training, up step (step exercises) and rope Jumping .However the investigator was assessing the study participant before training, at the six weeks of training and after 12 weeks of training to investigate the effect of aerobic exercises on enhancing muscular endurance, strength and flexibility of harar junior secondary school male students. The data collected from the study was analyzed using SPSS

version 20 software. And discussed the result which was obtained at Pre, during and post training test as well as comparing the subjects result with the norm of each test. The paired sample t-test was used for this study. Based on the analysis made, at the end of the program it was observed that significantly among the participants due to the program significant change were observed in improvement of muscular endurance, muscular strength and flexibility of the trainees. The major finding of this study showed that 12 weeks of aerobics exercise had significant effects on muscular endurance, muscular strength and flexibility of harar junior secondary school students

5.2. Conclusions

Based on the major findings of the study the following pointes are stated as conclusions.

- Physical exercise had significant effect on enhancement of Muscle strength, endurance and flexibility and changed significantly. This was because of well-designed physical exercise program had positive effect in enhancing these fitness components.
- A research conducted on students, who engaged in low, moderate and high intensity exercise program, indicates that the exercise given to the subjects had a positive effect on enhancing muscular endurance, strength and flexibility performance. As well as most of the individual who participates in physical exercises has got an improved fitness.
- Strength training, such as push up, sit up, trunk lift, parellal dips, triceps dips on stair/chair and circuit training, up step (step exercises) rope Jumping and flexibility exercises are important for enhancing muscular endurance, strength and flexibility for the students.
- The study indicates that Aerobic exercise is a key to bring the change in the muscular strength, and muscular endurance of upper body of the students..
- The study indicates that, there were enhancements of the participant's range of motion in the joints (flexibility). The reason behind this change was physical exercise training that they were participating in well-designed training program.

5.3 Recommendations

Based on the findings of the research the following recommendations were made:

- Health related Physical fitness programmers should be incorporated into the training programmers at school level. Such physical fitness programmers should consider some selected health-related physical fitness components. This will help to improve the health-related physical fitness deficiencies of the male students, as revealed by the conclusions of the study.

- The School should be equipped with physical fitness training facilities and apparatus just uses them during their leisure time to improve their physical fitness status.

- As a means to improve the general health status of all students, a day should be declared by School for sports and games. Recreational and sporting competitions should be encouraged among the various classes.

- In view of the benefit of aerobic exercises due attention has to be given to Muscular Endurance, Strength and Flexibility as part of physical education program for all high school students.

- Individuals need to participate in aerobic exercises to promote Muscular Endurance, Muscular Strength and Flexibility.

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7. APPENDICES

Appendix- A:

HEALTH HISTORY AND PHYSICAL READINESS QUESTIONNAIRE OF THE PARTICIPANTS

This questionnaire is designed to obtain information on the health status and physical readiness of the subjects participating for the research study. The information will be kept strictly confidential. For students: please read the following question carefully and indicate your correct response to each question by encircling it on the choice letter given.

1. Do you have a recent physical injury such as bone, muscle and joint which will be aggravated by physical exercise? A. Yes B. No

If yes indicate the type of injury that you had_____

2. Do you have suffered with heart condition? A. Yes B. No

3. Identify any medical problems that you had

A. Cardiovascular C. Respiratory D. None

B. Neuromuscular

4. Have you ever felt pain in your chest when you do physical exercise?

A. Yes B. No

5. Are you taking any prescription of medicines recently?

A. Yes B. No

If yes, name them below: _

Name of drug Dosage

_____ _____

_____ _____

_____ _____

6. Have you ever suffered from shortness of breath at rest or with mild exercise?

A. Yes B. No

7. Is there any history of Coronary Heart Disease within your family?

A. Yes B. No

8. Do you ever feel feint, have spells of dizziness or have you ever lost consciousness?

A. Yes B. No

9. Do you currently drink more than the average amount of alcohol per week (21units for men and 14 units for women (1 unit = ½ pint of beer/cidr/larger or 1small glass of wine)

A. yes B. No

10. Do you currently smoke?

A. Yes B. No

11. Are you currently exercise regularly (at least 2 times per week) and/or work in a job that is physically demanding.

A. Yes B. No

12. Do you know of any other reason why you should not participate in a program of physical activity?

A. Yes B. No

If yes explain your reason here

_____

_____I hereby state that I have read, understood and answered honestly the questions above. I also state that I wish to participate in activities, which include aerobics

Client's full Name: _____Trainer's Name:_____

Client's Signature: _____ Trainer's Signature:_____

Date: _____Date:_____

Appendix-B:

Consent to Participate Voluntarily In This Research Study

Harar junior Secondary School.

Researcher's name**: Abdusemed Aman Gamo**

Supervisor's name: **Dr Desta Enyew**

Thesis Title: Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Student of Harar Junior Secondary School,Harar city, Harari Regional State.

You are being asked to participate in this research study as described below. All this like research study carried out are governed by the regulations for research on human beings. These regulations require that the researcher should obtain a signed agreement (consent) from you to participate in this research project. The researcher will explain to you in detail the purpose of the project, the procedures to be used the potential benefits and the possible risks of participation in this study. You can ask the researcher any questions that you may have about the study, and expect to receive satisfactory answers the same. A basic explanation of the project is summarized below. After discussion, if you agree to participate in the study, please sign this form in the presence of the researcher. You may discontinue at any time from the study if choose to do so.

1. Purpose and procedures:

The purpose of this research project is to investigate the Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Student of Harar Junior Secondary School,Harar city, Harari Regional State.. The subjects to be involved in this study will

be 40 male students and participation on this study will require you to perform a certain test to measure the physical fitness variables

2. Risk and the safeguards:

The risks of this research study are small. While administering the tests and during training session you may experience localized muscle fatigue in your thighs. You might feel some muscle soreness and fatigue during and after the cessation of the exercise tests and training but we do not expect any unusual risks as a direct result of this study. If any unexpected physical injury occurs, appropriate first aid will be provided, but no financial compensations will be given.

3. Confidentiality

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

4. Contact address: institutional research ethics review committee (IRERC)-

Abdusemed Aman Gamo----------+251927941940

Email address----------abdusamadaman@gmail.com

I certify that I have read and fully understand the above project. I willingly consent to participate.

Signature of subject: _____

Name: _____

Parent's signature: _____

Name: _____

Address: _____

Date: _____

I certify that I have explained fully to the above subject the nature, the purpose, the potential benefits and the possible risks involved in this research study.

Date: _____

Signature of Investigator: _____

Appendix C

Subjects` Fitness Assortment Record Sheet

Table 1: Raw data of push up results in PT,DTT and PoT

Subject code	Pre test	During test	Post test	Remarks
S1	18.00	23.00	28.00	
S2	24.00	29.00	34.00	
S3	24.00	26.00	31.00	
S4	8.00	10.00	12.00	
S5	10.00	14.00	18.00	
S6	25.00	28.00	32.00	
S7	14.00	17.00	20.00	
S8	28.00	33.00	36.00	
S9	12.00	16.00	21.00	
S10	15.00	19.00	22.00	
S11	14.00	16.00	20.00	
S12	15.00	16.00	18.00	
S13	28.00	31.00	35.00	
S14	14.00	18.00	21.00	
S15	13.00	18.00	24.00	
S16	27.00	32.00	36.00	
S17	9.00	14.00	19.00	
S18	18.00	24.00	29.00	
S19	25.00	31.00	37.00	
S20	31.00	35.00	39.00	
S21	21.00	26.00	30.00	
S22	32.00	37.00	40.00	
S23	9.00	14.00	19.00	
S24	20.00	24.00	30.00	
S25	29.00	34.00	39.00	
S26	38.00	43.00	46.00	
S27	20.00	25.00	30.00	
S28	18.00	23.00	28.00	

S29	10.00	15.00	20.00	
S30	17.00	22.00	26.00	
S31	22.00	26.00	30.00	
S32	17.00	22.00	25.00	
S33	9.00	13.00	17.00	
S34	31.00	36.00	40.00	
S35	25.00	30.00	33.00	
S36	20.00	26.00	31.00	
S37	14.00	19.00	22.00	
S38	18.00	22.00	25.00	
S39	32.00	35.00	38.00	
S40	12.00	16.00	20.00	

Table 2:Raw data of sit and reach results in PT,DTT and PoT

Subject code	Pre test	During test	Post test	Remarks
S1	11.00	13.00	15.00	
S2	13.00	15.00	17.00	
S3	3.00	8.00	8.00	
S4	5.00	7.00	9.00	
S5	8.00	9.00	11.00	
S6	12.00	13.00	15.00	
S7	6.00	8.00	10.00	
S8	9.00	12.00	14.00	
S9	3.00	4.00	6.00	
S10	5.00	8.00	12.00	
S11	13.00	15.00	17.00	
S12	14.00	15.00	16.00	
S13	11.00	13.00	15.00	
S14	3.00	5.00	7.00	
S15	8.00	10.00	12.00	
S16	12.00	14.00	16.00	
S17	7.00	11.00	14.00	
S18	9.00	12.00	13.00	
S19	3.00	5.00	9.00	
S20	13.00	15.00	18.00	
S21	6.00	8.00	9.00	
S22	8.00	11.00	13.00	
S23	7.00	8.00	9.00	
S24	9.00	13.00	16.00	
S25	3.00	5.00	9.00	
S26	3.00	4.00	7.00	
S27	8.00	9.00	11.00	

S28	8.00	10.00	12.00	
S29	13.00	14.00	16.00	
S30	6.00	8.00	9.00	
S31	9.00	12.00	15.00	
S32	3.00	5.00	6.00	
S33	10.00	12.00	14.00	
S34	7.00	8.00	11.00	
S35	10.00	13.00	15.00	
S36	11.00	13.00	14.00	
S37	14.00	16.00	19.00	
S38	4.00	6.00	9.00	
S39	15.00	16.00	18.00	
S40	12.00	13.00	15.00	

Table3:Raw data of sit up results in PT,DTT and PoT

Subject code	Pre test	During test	Post test	Remarks
S1	17.00	20.00	24.00	
S2	21.00	24.00	27.00	
S3	18.00	20.00	22.00	
S4	18.00	21.00	23.00	
S5	20.00	23.00	26.00	
S6	23.00	25.00	27.00	
S7	18.00	19.00	21.00	
S8	3.00	5.00	8.00	
S9	26.00	28.00	31.00	
S10	16.00	20.00	25.00	
S11	4.00	6.00	9.00	
S12	19.00	20.00	22.00	
S13	18.00	21.00	24.00	
S14	23.00	37.00	31.00	
S15	19.00	23.00	27.00	
S16	26.00	28.00	31.00	
S17	18.00	20.00	23.00	
S18	4.00	8.00	12.00	
S19	20.00	23.00	26.00	
S20	6.00	8.00	10.00	
S21	18.00	23.00	26.00	
S22	18.00	20.00	23.00	
S23	17.00	18.00	21.00	
S24	17.00	20.00	23.00	
S25	19.00	22.00	24.00	
S26	4.00	6.00	9.00	
S27	17.00	20.00	22.00	

S28	6.00	8.00	9.00	
S29	30.00	33.00	36.00	
S30	17.00	19.00	22.00	
S31	22.00	26.00	28.00	
S32	3.00	6.00	9.00	
S33	20.00	23.00	25.00	
S34	28.00	29.00	30.00	
S35	27.00	30.00	33.00	
S36	7.00	7.00	7.00	
S37	20.00	26.00	30.00	
S38	17.00	24.00	28.00	
S39	21.00	23.00	25.00	
S40	19.00	23.00	27.00	

Appendix-D

Description of the training schedule

In sport training it needs well designed and prepared plan. The purpose of a 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, during and after training, exercises should be selected and specific to the selected fitness component needed to develop, it should follow the training principles and also it should be well adjusted to the participants fitness level and to the weather condition. Training plan can be a short term or it can be a long term plan. Basically, some fitness components need short term training and the others need to train for a long period of time. Due to this reason, the researcher will be concentrated on a short term training plan (three months). One of the most important rules of training for results comes back to the principle of Arnold's book (Arnold's encyclopedia of Body building) states that, the intensity of the workout and the frequency of the training session play an important role in stimulating muscle growth and performance improvement. Change comes from exercise, exercises are physical stressors. Training too often or with too much intensity and not allowing proper rest between sessions could cause either an overuse injury or

load to overtraining, both of which can significantly limit a client's ability to achieve fitness goals. https://www.acefitness.org/blog

Planning the Session and the Training Weeks

Based on the above mentioned reasons and others the researcher will use the training principles. So, this training session is designed for three months, and based on the principle of frequency, intensity, and principle of rest and recovery were four days per week, The training session were starts with warming up exercises and it was continue up to the cool down exercises.

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, the body goes through a process of rebuild and repair to replenish its energy reserves consumed by the exercise. The frequency of exercise is a fine balance between providing just enough stress for the body to adapt and allowing enough time for healing and adaptation to occur a program that works every body part every session should be completed 4 days a week with a day's rest between sessions. So, these studies were applied for four days of a week and for a total of 12 weeks (three months).Source:www.cardiosmart.org(AmericanCollegeofCardiology)andhtt://m.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/mskpages/exercise-intensity?

Exercise Intensity

Exercise intensity refers to how hard your body is working during physical activity. Your health and fitness goals, as well as your current level of fitness, will determine your ideal exercise intensity. The goal is work hard, but not too hard. Typically, exercise intensity is described as low, moderate, or vigorous. The researcher uses the first month of the training Low intensity (40-45%MHR), the second month of the training Moderate intensity(55-69%MHR) and the end of the month or month three High intensity (≥70%MHR).For maximum health benefits, the goal is to work hard, but not too hard, described as moderate-intensity by the (National Physical Activity Guidelines for Australians). These guidelines recommend that for good health, you should aim for at least 30 minutes of moderate-intensity physical activity on most days. This is the same for women and men (http://www.betterhealth, 2013). The process of determining and controlling appropriate exercise intensity presents a challenge, which has implications related to both physiological changes and to individual compliance within an exercise program. Kemi O., et al.

(2003) Several measurements for gauging exercise intensity for various exercise modalities have been devised and applied. These include proportion of maximal oxygen uptake (%VO2 max), proportion of maximal heart rate (%HRmax), proportion of maximal heart rate reserve (%HRRmax), and blood lactate indices. The following will cover the main principles of predicting and controlling exercise intensity by extrapolation from the relationships between oxygen uptakes, heart rate, and power output and running speed. Ideally, proportions of the O2 max are used to specify exercise intensity levels. The recommended intensity range is normally between 40% and 85% depending on the health and training status of the individual (ACSM, 1995).

Measuring Exercise Intensity

There are various ways to measure exercise intensity to make sure the body is getting the most out of every workout. One coach may need to experiment to find out which method of measuring exercise suits best.

There are three different measuring methods include:

- Target Heart Rate Method
- Talk Test Method
- Exercise Rating Scale

Measuring heart rate by taking pulse

Taking your pulse at regular intervals lets you know whether you are exercising within your target heart rate range. Some tips include.

- Take your pulse before you warm up
- Take your pulse again when you've been exercising for about 5-10 minutes
- Continue taking your pulse at regular intervals

The radial pulse is located on your inner wrist. To measure it, you should:

- Put the first three fingers of one hand against the inner wrist of the other hand just below the thumb
- Lightly press your fingers into the hollow next to the tendon on the thumb-side your artery lies just beneath the skin
- Using a watch with a second hand, count your pulse for 15 seconds. Multiply this figure by four to get your beats per minute. (For example, 31 pulse beats over 15 seconds equals a pulse

rate of 124 beats per minute.) You can also take your pulse by pressing your fingers lightly against one of your carotid arteries, located on either side of the windpipe. Factors known to influence heart rate It's not just exercise that affects your heart rate. Your beats per minute could be raised by a number of internal and external factors including:=Hot weather, Caffeine intake, Time of day, Hormone fluctuations, Stress or anxiety Cigarette smoking and Medications
Source: www.cardiosmart.org(American College of Cardiology) and betterhealth.vic.gov.
Based on the above mentioned reasons and others the researcher was used the training program lasts for about 12 weeks and Participants were exercising four times in week with 60 minutes of each training days in a week for 12 consecutive weeks. One day was skipped (rest day) in between exercise session days with last consecutive rest daysHowever, the result may be fluctuated due to the above mentioned influenced factors. The main objective of this general training schedule/plan was to investigate Effect of 12 Weeks Aerobic Exercise on Muscular strength, Muscular Endurance and Flexibility of Male Student of Harar Junior Secondary School,Harar city, Harari Regional State. By keeping all mentioned in the above, the training schedule is presented on the coming pages.

Table 4: First Month Training Schedule, (December 2016)

- **Duration 60minutes**
- **Intensity Low 40-45%HRmax**

Days	Types of exercise	Duration (Minute)	Sets	Frequency	Recovery time	Intensity
Monday	. General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m	-	-		Low (40-45%HRmax)
	Static stretching exercises	10m	1	1x10m	30s	
	Rope jumping	6m	1	2 x 3m	1min	
	Triceps on stairs/chair	25m	4	4 x 6m	2min	

	Cooling down and stretching exercise	5m				
Wednesday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Ballistic stretching exercise	10m	1	1 x 10m	30s	
	Circuit training	20m	4	4 x 5m	2m	
	sit up activity	10m	5	5 x 2m	2m30s	
	Cooling down and stretching exercises	5m				
Friday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	trunk lift	10m	5	5x2m	2m30s	
	Push up	12m	5	6 x 2m	3m	
	Static stretching exercises	15m	5	5 x 3m	2m30s	
	Cooling down and stretching exercises	5m				
Saturday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Push up	12m	5	6x2m	3m	
	Sit up	12m	5	6x2m	3m	
	Sit and reach	12m	5	6x2m	3m	
	Cooling down and stretching exercises	5m				

Table 5; Second month training schedule (January 2017)

- **Duration 60minutes**
- **Intensity Moderate 55-69% HRmax**

Days	Types of exercise	Duration (Minute)	Sets	Frequency	Recovery time	Intensity
Monday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m	-	-		Moderate (55-69% HRmax)
	Push up, and different types of upper body strengthening exercise	12m	4	4x 3m	2m	

	Rope jumping	15m	5	5x 3m	2m30s	
	Ballistic stretching exercises	15m	1	1 x 15m	30s	
	Cooling down and stretching exercise	5m				
Wednesday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	trunk lift	12m	4	4 x 3m	2m	
	Flexibility exercise or sit and reach	12m	4	4 x 3m	2m	
	sit up activity	15m	5	5 x 3m	2m30s	
	Cooling down and stretching exercises	5m				
Friday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Circuit training	12m	4	4 x 3m	2m	
	Push up	12m	4	4 x 3m	2m	
	Static stretching exercises	15m	5	5 x 3m	2m30s	
	Cooling down and stretching exercises	5m				
Saturday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Push up	12m	4	4 x 3m	2m	
	Sit up	12m	4	4 x 3m	2m	
	Sit and reach	15m	5	5 x 3m	2m	
	Cooling down and stretching exercises	5m				

Table 6; Third month training schedule (February 2017)

- **Duration 60minutes**
- **Intensity above70%HRmax(High intensity)**

Days	Types of exercise	Duration (Minute)	Sets	Frequency	Recovery time	Intensity
Monday	General and specific warming up exercises walking, jogging, running and stationed	10m	-	-		High Intensity

	general and specific stretching exercises.					(>70%HRmax)
	Star jump, squat jump, jumping jacks	15m	3	3 x 5m	1m30s	
	Rope jumping	15m	3	3 x 5m	1m30s	
	Push up	10m	2	2 x 5m	1m	
	Cooling down and stretching exercise	6m				
Wednesday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Floor exercise	14m	2	2 x 7m	1m	
	Step exercise and sit and reach	14m	2	2x 7m	1m	
	sit up activity	14m	2	2 x 7m	1m	
	Cooling down and stretching exercises	5m				
Friday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Circuit training	18m	2	2x9m	1m	
	Rope jumping	4m	1	1 x 4m	30s	
	Sit up	10m	2	2 x 5m	1m	
	Static stretching exercises	10m	1	1 x 5m	30s	
	Cooling down and stretching exercises	5m				
Saturday	General and specific warming up exercises walking, jogging, running and stationed general and specific stretching exercises.	10m				
	Push up	12m	2	2 x 6m	1m	
	Sit up	12m	2	2 x 6m	1m	
	Sit and reach	12m	2	2 x 6m	1m	
	Rope jumping	5m	1	1 x 5m	30s	
	Cooling down and stretching exercises	5m				

Appendix E

Table 7; Paired Sample T-test Results of Each Parameter

Variables	Tests	Mean values	MD	SD	SIG	Lower bound	Upper bound	T-value
Push up	PT-DTT	19.65-23.95	-4.3	1.16	0.00*	-4.67	-3.92	-23.46

	PT-PoT	19.65-28.02	-8.04	1.87	0.00*	-8.97	-7.77	-28.22
Sit and reach	PT-DTT	8.35-10.40	-2.05	0.93	0.00*	-2.34	-1.75	-13.90
	PT-PoT	8.35-12.52	-4.17	1.27	0.00*	-4.58	-3.76	-20.64
Sit up	PT-DTT	15.20-17.47	-2.27	0.75	0.00*	-2.51	-2.03	-19.16
	PT-PoT	15.20-19.90	-4.70	1.36	0.00*	-5.13	-4.26	-21.81

Appendix-F

Table 8; Norms of Muscular Endurance, Strength and flexibility test

The Push Ups test for Men

The following table, adapted from Golding et al. (1986), provides normative data for the Push Ups for Men

Age	Excellent	Good	Above Average	Average	Below Average	Poor
16-19	>56	47-56	35-46	19-34	11-18	<11

Normative data for sit up 16-19 years old

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>30	26-30	20-25	17-19	<9

Source: Davis B. 2000.

Normative data for the Sit and Reach test

The following table is for 16 to 19 year olds (Davis. 2000, p. 126)

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>14	11-14	7-10.9	4-6.9	<4

Source: Davis B. 2000.

Appendix-G

LIST OF FIGURES IN THE APPENDIX

Figure1. Picture A,Picture B and picture C subject performing Sit up, Push up and Sit and reach test

Figure 2 Map of the study site

Source: https://www.google.co.uk/search?q=Map+of+harari+city