

**EFFECTS OF SELECTED AEROBIC EXERCISES ON HEALTH
RELATED PHYSICAL FITNESS COMPONENTS: THE CASE OF
AMBO TOWN U-17 MALE FOOTBALL PROJECT TRAINEES;
AMBO TOWN, OROMIA REGIONAL STATE, ETHIOPIA.**

M.Sc. THESIS

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**Effects of Selected Aerobic Exercises on Health Related Physical
Fitness Components: The Case of Ambo Town U-17 Male Football
Project Trainees; Ambo Town, Oromia Regional State, Ethiopia**

**A Thesis Submitted to the Department of Sport Science
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**In partial Fulfillment of the Requirements for the Degree of
MASTER OF SCIENCE IN SPORT MEDICINE**

By

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As Thesis Research Advisors, we hereby certify that we have read and evaluated this thesis entitled **“Effects of Selected Aerobic Exercises on Health Related Physical Fitness Components: The Case of Ambo Town U-17 Male Football Project Trainees; Ambo Town, Oromia Regional State, Ethiopia”** prepared by Mr .Tilahun Bikila. We recommend that it can be submitted as fulfilling the thesis requirement.

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DEDICATION

Dedicated to my beloved wife **Desta Alemayehu** for nursing me with affection and love, and for her 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 Master of Science Degree in 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 any where for the award of any Academic Degree, Diploma, or Certificate. Brief quotations from this thesis are allowable with out special permission, provided that accurate acknowledgement of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the Head of the Major Department or the Director of Postgraduate Program Directorate when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the Author.

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BIOGRAPHICAL SKETCH

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ACRONYMS AND ABBREVIATIONS

ACSM	American College of Sport Medicine
BMI	Body Mass Index
BPM	Beats Per Minute
CSA	Cross Sectional Area
CVE	Cardiovascular Endurance
DTT	During Training Test
EHR	Exercise Haert Rate
FG	Fast-glycolytic
GYM	Gymnasium
HRR	Haert Rate Reserve
HU	Haramaya University
MD	Mean Difference
MHR	Maximum Heart Rate
PoT	Post Training Test
PTT	Pre Training Test
PU	Push Up
RHR	Resting Heart ate
RPE	Reting of Precieved Exertion
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
THR	Target Heart Rate
TI	Training Intensity

TMR	Twelve Minute Run
U-17	Under 17 Years
WHO	World Health Organization

TABLE OF CONTENTS

DEDICATION	iii
STATEMENT OF THE AUTHOR	iv
BIOGRAPHICAL SKETCH	v
ACKNOWLEDGMENTS	vi
ACRONYMS AND ABBREVIATIONS	vii
LIST OF TABLES	xii
LIST OF TABLES IN THE APPENDIX	xiii
LIST OF FIGURES	xiv
<i>ABSTRACT</i>	xv
1. INTRODUCTION	1
1.1. Back Ground of the Study	1
1.2. Statement of the Problem	2
1.3. Scope of the Study	3
1.4. Significance of the Study	3
1.5. Objectives of the Study	4
1.5.1. General objective	4
1.5.2. Specific objectives	4
2. REVIEW OF LITERATURE	5
2.1. Aerobic Exercise and Its Benefits	5
2.1.1 Aerobic exercise	5
2.1.2. Benefits of aerobic exercise	5
2.1.3. Studies on aerobic exercise	6
2.2. Physical Fitness	9
2.2.1. Physical fitness	9
2.3. Health Related Physical Fitness	10
2.4. Effect of Aerobic Exercise on Body Composition	11

TABLE OF CONTENTS(*contineud*)

2.5. Effect of Aerobic Exercise on Flexibility	11
2.6. Effect of Aerobic Exercise on Muscular Endurance	11
2.7. Effect of aerobic exercise on cardiovascular endurance	12
2.8. Effect of Aerobics Exercise on Muscular Strength	12
2.9. Health Related Physical Fitness Test	13
2.9.1. Test for body compositions	13
2.9.2. Test for flexibility	13
2.9.3. Test for muscular endurance	13
2.9.4. Test for cardiovascular endurance	14
2.9.5. Test for muscular strength	14
2.10. Strength Training for FootBall Players	15
3. MATERIALS AND METHODS	16
3.1. Description of the Study Area	16
3.2. Study Period	16
3.3. Definition of Variable	17
3.4. Experimental Design	17
3.5. Source of Data	17
3.6. Study Population	18
3.7. Sampling Size and Sampling Techniques	18
3.8. Inclusion and Exclusion Criteria`	18
3.9. Data Collection Instrument	18
3.10. Method and Procedures of Data Collection	18
3.10.1. Body mass index (BMI)	19
3.10.2. Sit and reach test	19
3.10.3. Sit up test	19

TABLE OF CONTENTS(*continueud*)

3.10.4. Twelve (12) Minutes Run/ Walk Test (Cooper test)	20
3.10.5. Push-Ups Test	20
3.11. Training Protocol	21
3.12. Data Quality Control	21
3.13. Methods of Data Analysis	22
4. RESULTS AND DISCUSSIONS	23
4.1. Overview	23
4.2. Demographic Characteristics of the Study Participants	23
5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	30
5.1. Summary	30
5.2. Conclusions	31
5.3. Recommendations	32
6. REFERENCES	33
7. APPENDICES	39

LIST OF TABLES

Tables	Pages
1. The mean value of body mass index test results of pre,during and after 12 weeks aerobic exercise for both groups.	23
2. The mean values of Sit and reach test results of pre, during and after 12 weeks aerobic exercise for both groups.	24
3. The mean values of Sit up test results of pre, during and after 12 weeks aerobic exercise for both groups.	25
4. The mean values of twelve minutes test results of pre, during and after 12 weeks aerobic exercise for both groups .	25
5. The mean values of push up test results of pre, during and after 12 weeks aerobic exercise for both groups.	27
6. The Mean Difference Values and Significance level of each test results of both groups.	28

LIST OF TABLES IN THE APPENDIX

Tables	Page
Paired t test results of BMI	44
Paired t test results of set and reach	44
Paired t test results of set up	44
Paired t test results of push up	45
Paired t test results of twelve minute run	45
Training Schedule of Three Months	51
Norms	54
Raw data	56

LIST OF FIGURES

Figure	Page
1. Map of the study Site	66

Effects of Selected Aerobic Exercises on Health Related Physical Fitness Components: The Case of Ambo Town U-17 Male Football Project Trainees; Ambo Town, Oromia Regional State, Ethiopia

ABSTRACT

The aim of the study was to assess the effects of selected aerobic exercises on health related physical fitness components :the case of Ambo Town U-17 male football project trainees; Ambo Town, Oromia Regional State Ethiopia. Ambo Town U-17 male football project trainees with the age ranges of 15-17 years were selected for the study. The purposive sampling technique was used to select the subjects. Fourty subjects were identified by standard format of health history questionnaire. The subjects were assigned in two equal streams of 20 experimental group and 20 control group by complete random sampling technique. The experimental group has been participated on selected aerobics exercises for 12 weeks and the control group has not participated on selected aerobics exercises for 12 weeks . The data obtained from the subjects were analysed by stational package of social sciences version 20 software. The comparison of means was estimated by paired t-test. The level of significance was set at 0.05%. The result of Body mass index in the experimental group was 19.935 ± 1.03988 and $20 \pm .89560$ (.065mean difference) while the Body mass index in the control group was 20.1 ± 1.35647 and 20.68 ± 1.28443 (.5800mean difference) during and after training respectively. Similarly results of filexibility(sit and reach), muscular endurance(situp), cardiovascular endurance(Twelve minutes run) and muscular strength(push up) in experimental group the result of sit and reach 8.35 ± 1.13671 and 13.85 ± 1.46089 (5.500mean difference), situp $17.8 \pm .76777$ and 25.15 ± 1.84320 (7.3500mean difference), TMR 2150.9 ± 230.70850 and 2418.6 ± 190.56492 (145.95mean difference) push up 17.4 ± 2.87274 (6.2mean difference) and 30.95 ± 2.74293 (267.7mean difference), during and after training respectively. While the results of the same parameters in the control group for sit and reach 8.2 ± 1.19649 and $10.8 \pm .89443$ (2.600mean difference) sit up $17.4 \pm .88258$ and 19.8 ± 1.10501 (2.400mean difference), TMR 2190.9 ± 261.874 and 2278.35 ± 278.60598 (87.45mean difference), pushup 17.55 ± 2.87411 and 28 ± 1.94666 (10.45mean difference), during and after training respectively. The experimental group scored higher results than control group in sit and reach, sit up, TMR and push up parameters. The present study concluded that aerobics exercise with regular training of football higher result in both filexiblity ,muscular endurance, cardiovascular endurance and muscular strength of the subjects than results achieved only by football regular training.

Key Words: *Aerobics exercise, football, BMI, Flexibility, Muscular endurance, Cardiovascular endurance, Muscular strength.*

1. INTRODUCTION

This study deals with background of the study, statement of the problem, scope of the study, significance of the study and objectives of the study.

1.1. Back Ground of the Study

Football or Soccer as we know it in the UK, there are 265 million male and female football Players. The game is played by men, women and children of all ages and levels of abilities. Success as a player requires an appropriate mixture of mental, physical, technical and tactical abilities (FIFA, 2007).

Football is the most popular world wide sport which is characterized by high intensity, short term actions and pauses of varying length (Stroyer *et al.*, 2004). Football is being played in every nation without exception. Sport has become a popular past time among the people. Above all, interest in football has been growing in the worlds over the years.

Physical fitness in soccer is the physiological and functional status of the players that allows them to play the game effectively, resist fatigue and enhance global quality of life (Latimer-Cheung *et al.*, 2013). Fitness has Components such as muscular strength, muscular endurance, power, speed, cardiovascular endurance, flexibility, agility and coordination.

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 *et al.*, 1998). Physical activity and training is important for initiating and sustaining cardiovascular health. As such, encouragement from childhood and the possibility to participate in sports activity is a major health issue which must be sustained. Reaching adolescence, however, increasing expectations and competitive demands have

gradually emerged as an important aspect of recreational sports in the young (Armstrong and McManus, 2010).

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. Muscle contraction requires energy, which is supplied by nutrients from the digestive system and oxygen from the respiratory system.

These products are delivered to the muscles by the cardio-vascular system which also transports the waste products of metabolism such as carbon dioxide and lactic acid away from the contracting muscles.

The endocrine system is also involved with the control and regulation of movement. This system will efficiently with every day activities as they are physiologically adapted to that level (Rosser, 2001). Physical fitness is important for all human beings, irrespective of their age. A given work may not be carried out if the required physical strength is not available. Fitness is the first and foremost thing to enjoy the life fully (Reddy, 2012).

1.2. Statement of the Problem

Athletic performance in soccer is a function of aerobic fitness, anaerobic fitness, speed, muscular strength, muscular power, and agility. Aerobic exercise (training) involves large muscle groups in dynamic activities that result in substantial increases in heart rate and energy expenditure. Fitness is important at all levels of the game, whilst being essential for top-level players; it is beneficial for beginners who will improve both their effectiveness and enjoyment through good standards of fitness.

Fitness testing provides feedback to athletes and coaches on how the athlete is developing their various components of physical fitness. A coach can then compare the results of the tests to where they will like their athlete to be at that particular stage of their training program (Gabbett *et al.*, 2007).

Investigator's has more than twelve years work experiences in teaching physical education. With in this time the investigator of the study observed a lot of problems in body composition, range of motion, muscular endurance, cardiovascular endurance and muscular strength of Ambo town U-17 male football players. Hence, the investigator of this study planned to conduct a research on this area.

Therefore, the following basic reaserch questions in order to achieve the attainment of the stated objectives were answered in this study.

1. What is the effect of aerobic exercise on improvement of BMI, flexibility, muscular endurance, cardiovascular endurance and Muscular strength of Ambo town U-17 male football project trainees?

1.3. Scope of the Study

The scope of this study was on the effect of selected aerobic exercises on health related physical fitness components: the case of Ambo town U-17 male football project trainees Ambo Town, Oromia Regional State.

This intended to improve their health related physical fitness components by the intervention of some selected aerobics exercise for 12 consecutive weeks. This study was delimits itself and concentrated only on the selected exercises which were best and specific to improve the selected variables.

1.4. Significance of the Study

Currently, enhancement of athletic performance efficiency is designed upon critical study of human physiology, modern way of feeding and scientific way of training based up on a new findings and principles of investigation.

The main aim of this study was to analyze the effects of selected aerobic exercises on health related physical fitness components in Ambo town U-17 male football project trainees, but it does not mean that the out come of this research was only restricted to Ambo town U-17 male football project trainees; it also helps other Ambo town U-17 male football project trainees to understand the effects of aerobic exercises training in enhancing their health related physical fitness components such as body composition, flexibility, muscular endurance, ,cardiovascular endurance as well as muscular strength.

In addition to this the study was intended to signify the following importance :

1. It helps to motivate and encourage male football project trainees to engage in aerobic exercise to improve their physical fitness level.
2. It will help for others as research work for depth studies on the problem undertaken.

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 exercises on health related physical fitness components : the case of Ambo town U-17 male football project trainees of Ambo Town.

1.5.2. Specific objectives

The specific objectives of the study were:

1. To examine the changes induced by aerobic exercise on improvements of body composition after 12 weeks of aerobic exercise.
2. To examine the significance of aerobic exercise on the improvement of full range of motion.
3. To find out the significance of the aerobic exercise on improvement of muscular endurance.
4. To examine the significance of aerobic exercises on improving cardiovascular endurance.
5. To find out the significance of aerobic exercises on improvement of Muscular strength.

2. REVIEW OF LITERATURE

This study deals with aerobic exercise and its benefits, physical fitness, health related physical fitness, effect of aerobic Exercise on body composition, effect of aerobic exercise on flexibility, effect of aerobic exercise on muscular endurance, , effect of aerobic exercise on cardiovascular endurance, effect of aerobic exercise on muscular endurance and health related physical fitness test.

2.1. Aerobic Exercise and Its Benefits

2.1.1 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. (<http://www.newellness.com>)

2.1.2. Benefits of aerobic exercise

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. 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 on set 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).

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 moving from a lifestyle involving no exercise to one that involves some exercise can lead to substantial improvements in health. (Thomas *et al.*, 2008)

Aerobic activities should be used to develop cardiorespiratory 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 elevated level for an extended period .

This activity typically involve 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, tread mill and somewhat continuous in nature the intensity of work load can be easily regulated by controlling the pace(Shemelis, 2010).

2.1.3. Studies on aerobic exercise

Selvam 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 include 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 The ivannai Ammal College for women, Villupuram. The age group of the subjects ranged between 18 to 20 years. The selected subjects were divided into two groups.

The groups first trained for aerobic exercise. The training group under went 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 (ANCOVA) 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. Selvalakshmi (2007) conducted a study on the effect of varied aerobic 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 cardio respiratory 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.

(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 exercise 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, biceps, abdomen, super iliac, sub scapula, chest, body fat percent, heart rate, high density lipoproteins (HDL), low density lipoproteins (LDL), total cholesterol, and triglyceride between pre-test and post test 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. Furthermore, it may result in decreasing obesity in girls.

(Mills and Mae 1994) conducted a study on the effect of low intensity aerobic exercise on muscle strength, flexibility and change of balance among sedentary elderly person .The purpose of this study was to determine the effects of a low intensity aerobic exercise program on muscle strength and flexibility of the lower extremities and balance among sedentary elderly persons. This pre and posttest quasi-experimental study consisted of 47 sedentary elderly subjects not engaged in regular exercise and living in metropolitan housing in southwestern Ohio.

Convenience sampling was used with two apartment complexes randomly assigned to the experimental or comparison groups To prevent diffusion of treatment, subjects were assigned to these groups depending on their place of residence.

The 20 experimental subjects, with a mean age of 75.3, participated in eight weeks with low intensity of aerobic exercise while the comparison group (n=20), with a mean age of 74.8, maintained their usual level of activity for eight weeks. Experimental subjects also did the exercise on their own between classes.

The exercise group had significantly greater flexibility of the ankles and knee than the comparison group. No significant differences were found between the groups for muscle strength. Although balance and perception of balance were not significantly different between the groups, the experimental group improved their balance by 22.4% from pretest.

(Arslan, 2011)Conducted the study on the effects of an eight-week step-aerobic dance exercise programme on body composition parameters in middle-aged sedentary obese women in AksarayTurkey .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 programme (n=29) and a control group (n=20).

The subjects took part in a step-aerobic dance exercise programs 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 programs, significant differences were found in the subjects' weight, BMI, body composition parameters, waist-hip ratio (WHR), waist circumference (WC), fat percentage, lean body mass (LBM) and basal metabolic rate (BMR) in the experimental 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 modality for weight loss and in terms of body composition. There was a clear response to the eight-week step aerobic dance program in terms of central obesity in sedentary obese Turkish women.

2.2. Physical Fitness

2.2.1. 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 emergencies. (Caspersen *et al.*, 1985).

According to the American Medical Association, is: "the general capacity to adapt and respond favorably to physical effort." Individuals are physically fit when they meet ordinary and unusual demands of daily life safely and effectively without being overly fatigued, and have energy left for leisure and recreational activities (<http://www.com>). Physical fitness is in part genetically determined, but it can also be greatly influenced by environmental factors. Physical exercise is one of the main determinants (Andersen, 2003).

Physical educators classify physical fitness as skill related (related to sport performance) and health related fitness (associated with disease prevention and health promotion) which includes components such as cardio-respiratory endurance, muscular strength and endurance, body composition and flexibility (Howley, 2001).

Lack of physical fitness (physical inactivity) is therefore a primary modifiable risk factor for cardiovascular disease and an increasing assortment of accompanying chronic hypo-

kinetic (insufficient movement or activity) diseases, including: obesity, diabetes mellitus, cancer (breast and colon), bone and joint diseases (osteoporosis and osteoarthritis), depression, and hypertension (Katzmarzyk *et al.*, 2000a).

2.3. 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. (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.

The components of health related physical fitness are as follows:

Body composition refers to the make up of the body in terms of lean mass (muscle, bone, vital tissue, and organs) and fat mass. (Bangsbo, *et al.*, 2015).

Flexibility: Flexibility is the degree to which body segments can move or be moved around a joint. (Brown, 1986).

Muscular Endurance: the ability of a muscle or muscle group to perform repeated movements with a sub-maximal loads for extended periods of times (Gutin, 1980).

Cardiovascular Endurance: the efficiency with which the body delivers oxygen and nutrients needed for muscular activity and transports waste products from the cells. (Probart *et al.*, 1991).

Muscular Strength: refers to the force or tension that can be generated by a muscle or muscle group during one maximal effort. (Bouchard and Rankinen, 2001).

2.4. Effect of Aerobic Exercise on Body Composition

Regular aerobic exercises reduce the body fat percentage without the loss of the muscle as well as important effect on anthropometric and hematologic level of obese and overweight women(Evrin *et al.*, 2010).

Aerobic exercise including walking, running, and swimming has been proven to be an effective way to lose weight; Body Composition Changes for over fat or borderline over fat people, regular aerobic exercise reduces body mass and body fat. Increases in fat free body mass also accompany a regular program of resistance training. Exercise only, or exercise combined with calorie restriction, reduces body fat more than fat lost with only dieting because exercise conserves the body's lean tissue mass (Katch *et al.*, 2011).

2.5. Effect of Aerobic Exercise on Flexibility

Flexibility has been defined as 'the intrinsic property of body tissues, which determines the range of motion achievable without injury at a joint or group of joints, Flexibility determines how efficiently your muscles are. Increased flexibility has also been associated with decreased risk of acute and chronic (overuse) injuries. Poor flexibility can directly affect cardiovascular endurance, muscle strength and muscular endurance.

Physiologically flexibility can include extra-muscular (range of motion at a joint) and intramuscular factors such as hyper tonicity (knots) within the muscles themselves. Aerobic exercise and strengthening allows muscle to contract and flex.

Those muscles also need to be starch to protect them from injury and to improve range of motion in the joints .So aerobic activities has its own contribution for flexibility and balance. .(McArdle W.D. *et al*; Essential of Exercise Physiology; 2000).

2.6. Effect of Aerobic Exercise on Muscular Endurance

Muscular endurance, which represents multiple muscle contractions or a sustained musclecontraction over a period of time, for example during running, climbing, swimming, jogging, running on tread mill at the gym there will be muscle contraction those muscle contraction can assists the improvements of muscular endurance.

During aerobic exercise, minute ventilation increases and an increased load is placed on the respiratory muscles. Both the frequency and the speed of contraction in the muscle are increased, (Harms *et al.*, 2000).

2.7. Effect of aerobic exercise on cardiovascular endurance

Cardiovascular endurance (CVE) is one of the most important measures of overall health. A person's level of cardiovascular endurance helps predict probability of disease, quality of life, and ability to react to acute physical and mental stress. For healthy individuals, higher cardiovascular endurance also indicates an elevated level of physical fitness. (Corbett, 2009) Aerobic exercise use large muscle group to increase heart rate.

This causes faster and deeper breathing which maximize the oxygen in the blood. There are many studies which prove that cardiovascular endurance improved after aerobic exercise. Correctly performed aerobic exercise causes positive change in the body's cardio respiratory system. During maximum aerobic exercise the trained individual has increased maximum oxygen consumption and is better able to process oxygen and fuel can provide more energy to working muscle.

Aerobic capacity is the most widely accepted single indicator of one's cardio respiratory fitness level and it is one of the best types of activity for training and maintaining low percentage of body fat. (Probart *et al.*, 1991)

2.8. Effect of Aerobics Exercise on Muscular Strength

Muscular Strength is the ability of the muscle to exert force (USDHHS, 1996). For true assessment it would be necessary to test each major muscle group of the body. According to (Foss and Keteyian, 1998), "strength is the force or tension of a muscle or, more correctly, a muscle group can exert against a resistance in one maximal effort". Strength is greatest amount of force a muscle or muscle group can exert in a single effort. Muscular strength is the maximum force or tension level that can be produced by a muscle group" (Heyward, 1991).

Strength and power share importance with endurance in soccer play. Maximal strength is one basic quality that influences power performance. An increase in maximal strength is usually connected with an improvement in relative strength and, therefore with improvement of power abilities. A significant relationship has been observed between 1RM and acceleration and movement velocity (Hoff and Helgerud, 2004.)

2.9. Health Related Physical Fitness Test

2.9.1. Test for body compositions

Body mass index: BMI (Body Mass Index) is a measurement of body fat based on height and weight that applies to both men and women between the ages of 18 and 65 years. BMI can be used to indicate if you are overweight, obese, underweight or normal.

A healthy BMI score is between 20 and 25. A score below 20 indicates that you may be underweight; a value above 25 indicates that you may be overweight (www.bmi-calculator.net). BMI is just a guide - it does not accurately apply to elderly populations, pregnant women or very muscular athletes such as weight lifters. (WHO, 2012).

2.9.2. 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 on) 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 and girls is +1 to +10cm. (McArdle W.D. *et al*; Essential of Exercise Physiology; 2000).

2.9.3. 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 female is 29-39 for the age 18-25, 25-28 for the age 26-35, 19-22 for the age 36-45, 14-17 for the age 46-55, 10-12 for the age 56-65, 11-13 for the age 65+. (Golding *et al.*, 1986).

2.9.4. Test for cardiovascular endurance

Twelve (12) Minutes Run/ Walk Test (Cooper test)-The subjects of quasi experimental group started running on athletics track. The subjects did their best to run many laps around running track for 12 minutes. When 12 minutes over the subjects stopped running and they stood on their spot. Then, the amount of distance covered by subjects within twelve minutes and the exercise heart rate (EHR) of each subject were measured in meter and beat per minute. In addition, after getting plenty of resting time, resting heart rate (RHR) of the subjects was measured in best minute. (Probart *et al.*, 1991).

2.9.5. 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. Count the total number of pushups performed(www.topendsports.com)

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 and for women's is 11-20 for the age 17-19, 12-22 for the age 20-29, 10-21 for the age 30-39, 8-17 for the age 40-49, 7-14 for the age 50-59, 5-12 for the age 60-65. (Bouchard and Rankinen, 2001).

2.10. Strength Training for Football Players

The benefit of strength and strength training for footballers is well supported by the researchers. For example, Reilly (1990) showed that the stronger players outlasted the weaker players in terms of a regular place in the team, and had reduced injury risks.

The researchers recommend that leg strength in particular is developed, especially in the quadriceps and hamstrings, to help stabilize the knee joint, which is the most frequently injured joint in football (Reilly, 1990; Apor, 1998).

Similarly, some researchers agreed that knee-extension torque has been associated with success in the game and that strong hamstring muscles in relation to quadriceps are crucial to knee injury prevention (Adams, *et al.*, 1992).

The training rules for footballers must therefore reflect this need for good acceleration and maximum speed.

Apor (1998) suggests, in making fitness recommendations for footballers; that players need to develop the musculature of a sprinter. He mentioned the benefit of maximum leg-strength training with heavy resistances for developing acceleration and speed. Strength and conditioning programs for football require the development of, among other qualities, speed and speed endurance (Kraemer *et al.*, 2004).

It is known that in a relative short period, varying from 5 to 12 weeks, football players are able to improve their running speed, by high-quality and high-quantity practice, including besides football-specific training, strength and speed training (Sporis *et al.*, 2008; Kotzamanidis *et al.*, 2005). Performance improvements as a result of training programs are influenced by the pre-training level of the individual players (Bouchard and Rankinen, 2001).

3. MATERIALS AND METHODS

This chapter includes description of experimental site, study period, definition of variable, experimental design, source of data, study population, sampling size and sampling techniques, inclusion and exclusion criteria, data collection instrument, method and procedures of data collection, training protocol, data quality control and methods of data analysis.

3.1. Description of the Study Area

Ambo is a spa town and separate woreda in central Ethiopia. Located in the West Shewa Zone of the Oromia Region, west of Addis Ababa, this town has a latitude and longitude of 8°59'N 37°51'E and an elevation of 2101 meters.

Ambo is known for its mineral water, which is bottled outside of town; it is reportedly the most popular brand in Ethiopia. Nearby attractions include Mount Wenchi to the south with its crater lake, and the Guder and Huluka Falls. Ambo is also the location of a research station of the Ethiopian Institute of Agricultural Research; initiated in 1977, this station hosts research in protecting major crops in Ethiopia.

The 2007 national census reported a total population for Ambo of 48,171, of whom 24,634 were men and 23,537 were women. The majority of the inhabitants said they observed Ethiopian Orthodox Christianity, with 65.18% of the population reporting they observed this belief, while 27.45% of the population.

Source: Map data@2017 Google

The map of the study area is indicated on page 66.

3.2. Study Period

The Research study was carried out for three consecutive months From October 01, 2017 to December 30, 2017).

3.3. Definition of Variable

Body composition refers to the make up of the body in terms of lean mass (muscle, bone, vital tissue, and organs) and fat mass. (Bangsbo, *et al.*, 2015).

Flexibility: Flexibility is the degree to which body segments can move or be moved around a joint. (Brown, 1986).

Muscular Endurance: the ability of a muscle or muscle group to perform repeated movements with a sub-maximal loads for extended periods of times (Gutin, 1980).

Cardiovascular Endurance: the efficiency with which the body delivers oxygen and nutrients needed for muscular activity and transports waste products from the cells. (Probart *et al.*, 1991).

Muscular Strength: refers to the force or tension that can be generated by a muscle or muscle group during one maximal effort. (Bouchard and Rankinen, 2001).

3.4. Experimental Design

The pre, during and post tests on selected health related physical fitness parameters such as body composition, flexibility, muscular endurance, cardiovascular endurance and muscular strength were administered for selected subjects.

The participants were engaged in designed program of twelve weeks aerobic exercises such as split squat jumps, single leg vertical jump and lateral jump to box including warming up ,stretching and cooling down exercises with low and moderate intensity, for three days per week (Monday, Wednesday and Friday), for one hour per day.

3.5. Source of Data

Primary data were used in this research study. The primary data were obtained from the experimental variables according to the designed parameters.

3.6. Study Population

The study population of this research were Ambo town U-17 male football project trainees. Trainees between the age of 15 – 17 years old . The investigator of this study selected only 40 trainees from the total of 120 trainees.

3.7. Sampling Size and Sampling Techniques

The total number of study population were 120 in numbers. In order to select the samples for this experimental study, purposive sampling techniques were used to identify their health status and to know how much they were interested to be engaged on study. Subjects were categorized by random sampling techniques and their age range was from 15-17 years old were selected.

3.8. Inclusion and Exclusion Criteria`

Ambo town U-17 male football project trainee's, those without health problems and free of injury were included. In short trainee's with different problem that affect their performance were excluded through physical activity readiness questionnaires.

3.9. Data Collection Instrument

The whole data collection were performed more of quantitatively and objectively. Weight machines was used for body weight, mat, meter and watch were used for the rest parameters. The use of these principal data collection instrument was intended to explore a range of quantitative information. Writing pad was also used to record the data.

3.10. Method and Procedures of Data Collection

The data collected through fitness tests were analyzed, interpreted and tabulated in to a meaningful idea using manually and in computer software in order to compare the health related physical fitness variables changes observed among participants that under went aerobic exercise program. Data was analyzed using computerized statistical

package software (SPSS) version 20. The paired t-test will be used to compare the pre-training and post-training data. The level of significance was 0.05%.

3.10.1. Body mass index (BMI)

BMI is a calculation of body weight and height indices for determining degree of obesity. The most common formula for body mass index is body weight in kilograms divided by height in meters squared.

Therefore, during body mass index test the participants were removed their shoes and should have light clothes and stands on calibrated beam. The height in meters (m) and their weights in kilograms (kg) were recorded. Then, BMI was calculated with the following equation:

$$\text{BMI} = \text{weight} / \text{Height (m}^2\text{)}$$

3.10.2. Sit and reach test

The participants performed 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 trial were permitted to the subject and the best one from three trials were taken as their score. The subjects reached out and hold that position for a one-two seconds while the distance was recorded. (McArdle W.D. *et al*; Essential of Exercise Physiology; 2000).

3.10.3. 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) was counted as one. The scoring system which followed for this test was the total number of complete sit ups in 30 second. (Golding *et al.*, 1986).

3.10.4. Twelve (12) Minutes Run/ Walk Test (Cooper test)

To measure heart rate, simply check pulse. Place index and third fingers on the neck to the side of windpipe. To check pulse at wrist, place two fingers between the bone and the tendon over the radial artery — which is located on the thumb side of the wrist. When feel pulse, count the number of beats in 15 seconds. Then multiply this number by four to calculate beats per minute.

The Cooper 12-minute run test requires the person being tested to run or walk as far as possible in a 12 minute period. The objective of the test is to measure the maximum distance covered by the individual during the 12 minute period and is usually carried out on a running track by placing cones at various distances to enable measuring of the distance. A stopwatch is required for ensuring that the individual runs for the correct amount of time and whistle is used for starts and end of 12 minute run .

The subjects of quasi experimental group started running on athletics track. The subjects did their best to run many laps around running track for 12 minutes. When 12 minutes over the subjects stopped running and they stood on their spot. Then, the amount of distance covered by subjects within twelve minutes and the exercise heart rate (EHR) of each subject were measured in meter and beat per minute. In addition, after getting plenty of resting time, resting heart rate (RHR) of the subjects was measured in best minute. (Probart *et al.*, 1991).

3.10.5. Push-Ups Test

The muscles of the upper body and shoulders are another frequently measured muscle group. Push-up is used to measure the strength and endurance of upper body muscle

groups. Less muscular strength and endurance of the upper body and shoulder group may increase the chances that a person may have shoulder pain.

In this test, only the upper body is load. Before starting this push up tests the participants performed warming up and stretching exercises.

- The subjects started push-up (military position)
- Participants' hands were shoulder wide apart
- Arms extended straight out under the shoulders
- Back and legs in a straight line, and toes curled under.
- Starting in the up position,
- The completion of one complete push up (down and up) was counted as one pushup.
- The total numbers of pushups the subjects did in one minutes were recorded as their scores. (Bouchard and Rankinen, 2001).

3.11. Training Protocol

The training program was delivered for 12 weeks and three times in a week. The session begins with 10 minutes general and specific warming up period followed by main work for 45 minutes with low and moderate intensity of aerobics exercise. Then the session last up with 5 cooling down activities for the last 12 weeks. The training program was scheduled for the participants and the exercise training was given by the researcher. .

3.12. Data Quality Control

Data quality was assessed through standardized measurement of ACSM strength test was extremely important. In order to decrease common errors care was taken on the procedure of body mass index, sit and reach test, sit up test, TMR test, push up test and body weight measurement in kg were recorded. Standard procedure was taken for obtaining the measurements and used to gather the data from the subjects.

3.13. Methods of Data Analysis

The gathered data were to analyze by the statistical tool paired t test and interpreted the data that were collected from body mass index, flexibility, muscular endurance, cardiovascular endurance, muscular strength test and resistance based physical fitness before and after the intervention. Some of the parameters with standard norm used for body weight and strength tests were compared pre-test and post- test result to draw conclusion. Paired T test was used to compare the changes after investigation. All statistical calculations were carried out using SPSS package version 20. The level of significance was 0.05%. In general, both statistical and descriptive techniques were used for analysis where as statements and tables were used for interpretation and discussion.

4. RESULTS AND DISCUSSIONS

4.1. Overview

The purpose of this study was to find out the effects of aerobic exercises on improving health related physical fitness components of Ambo town U-17 male football project trainees. To achieve the purpose of the study 40 Ambo town U-17 male football project trainees were selected as a subjects and their age ranges was 15-17 years old.

Aerobic exercise was given for 12 consecutive weeks. The variables selected for this study were health related physical fitness components such as body composition, flexibility, muscular endurance, cardiovascular endurance and muscular strength during and posttest were conducted for all the 40 subjects that was categorized into control and experimental group equally and the variables of both groups were recorded.

The collected data were analyzed by using SPSS software version 20. The results for each fitness variables are discussed below.

4.2. Demographic Characteristics of the Study Participants

A total of forty (40) individuals, who were positively responded to the advertisement made. To obtain participants in the study were selected from Ambo town U-17 male football project trainees completed low and moderate intensity training program. From the total number of the study subjects; no one was lost motivation to follow up training program properly and no one was dropped out. 100% of the study subjects follow up training properly. Almost all participants were beginners for physical exercise.

Table 4.1. The Mean Value of Body Mass Index.

Control group				Experimental group		
Var	PT	DTT	PoT	PT	DTT	PoT
Wgt	48.85±3.15019	49.45±2.78104	50.25±2.57263	48.15±2.08440	48±2	48.4±1.42902
Ht	155.95±3.51650	155.95±3.51650	155.95±3.51650	155.25±3.33837	155.25±3.33837	155.25±3.33837

BMI	20.1±1.35647	20.35±1.42330	20.68±1.28443	19.935±1.03988	19.8750±1.11444	20±.89560
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Values are in the form of Mean \pm SD, PT= pre training test which was taken before aerobic exercise, DT=during training test which was measured at 6th week of aerobic exercise, POT= posttest which was taken after 12th week of aerobic exercise training, WT =Weight, HT =height, BMI=bodymass index.

As indicated in table 4.1, The mean values of each parameters showed that the weight and height of the participants was the same throughout the study. Which indicates no significance difference was observed on weight and height of the participants. But it was taken to calculate body mass index. The mean value of body mass index (BMI) was increased from one test to another among the groups. But no significant change was distinguished both groups. The EG exhibited .325% in BMI and 2.89% improvement was recorded in the CG. The main reason for the increment of BMI, especially in the CG was the increment of body weight (table 1). Hence, aerobic training shows changes on BMI of both groups. The result also showed that the weight and height was same throughout the study. Which indicates no significance difference was observed on weight and height of participants. But it was taken to calculate body mass index.

Table 4.2. The Mean Values of Sit and Reach test results of pre, during and after 12 weeks aerobic exercise.

Control group					Experimental group		
	Var	PT	DTT	PoT	PT	DTT	PoT
2	SitR	8.2±1.19649	8.75±1.06992	10.8±.89443	8.35±1.13671	10.8±1.23969	13.85±1.46089

Values are in the form of Mean \pm SD, PT= pre training test which was taken before aerobic exercise, DT=during training test which was measured at 6th week of aerobic exercise, POT= posttest which was taken after 12th week of aerobic exercise training, Var= Variables, SitR= Sit and Reach.

This was due to the 12 week's selected aerobics training and football training under which the participants went through. A greater improvement was recorded for control group due to they isolated from ingagement in aerobics training. The mean value of sit and reach

before training was 8.2 and 10.8 after training for control group. The mean value of sit and reach before training was 8.35 and 13.85 after training for experimental group. The mean of sit and reach was increased by 31.7% and 65.86% for control group and experimental group respectively throughout the study period. This was due to the 12 week's selected aerobics training under which the participants went through. A greater improvement was recorded for experimental group due to they were involved on aerobics training.

Table 4.3. The Mean Values of Sit Up test results of pre, during and after 12 weeks aerobic exercise for both groups.

Control group					Experimental group		
	Var	PT	DTT	PoT	PT	DTT	PoT
3	Sit up	17.4±.88258	18.3±.80131	19.8±1.10501	17.8±.76777	20.6±1.39170	25.15±1.84320

Values are in the form of Mean ± SD, PT= pre training test which was taken before aerobic exercise, DT=during training test which was measured at 6th week of aerobic exercise, POT= posttest which was taken after 12th week of aerobic exercise training, Var= Variables, Sit up=Sit up.

The mean value of sit up before training was 17.4 and 19.8 after training for control group. The mean value of sit up before training was 17.8 and 25.15 after training for experimental group. The mean of sit up was increased by 13.79% and 41.29% for control group and experimental group respectively throughout the study period. This was due to the 12 week's selected aerobics training under which the participants went through. A greater improvement was recorded for experimental group due to they were involved on aerobics training. The finding of this study was corroborated by Li et al. (2006) who did his study on the Effectiveness of Aerobic Exercise Intervention on Worksite Health-Related Physical Fitness -A Case in a High-Tech Company.

Table 4.4. The Mean Values of Twelve Minutes test results of pre, during and after 12 weeks aerobic exercise.

Control group					Experimental group		
	Var	PT	DTT	PoT	PT	DTT	PoT
4	TMR	2190.9+261.87 400	2198.8+266.32224	2278.35+278.6059 8	2150.9+230.70850	2272.6500+233.2 9409	2418.600+190.5649

Values are in the form of Mean \pm SD, PT= pre training test which was taken before aerobic exercise, DT=during training test which was measured at 6th week of aerobic exercise, POT= posttest which was taken after 12th week of aerobic exercise training, Var= Variables, TMR = twelve minutes run.

The mean value of control group for pre training tests results of twelve minutes run was 2190.9+261.87400 during training test mean value result was 2198.8+266.32224 and post training test mean value result of twelve minutes run was 2278.35+278.60598. The same parameter for experimental group of pre training tests results of twelve minutes run was 2150.9+230.70850 during training test mean value result was 2272.6500+233.29409 and post training test mean value result of twelve minutes run was 2418.600+190.56492. From these results the researcher were observed the significant improvements in their performance of the subjects due to physical fitness exercises. When we compare 12 minutes run of pre and post test result of the participants after 12 weeks of exercises program. It showed a significant increment on the performance of the subjects within 267.7 meters mean differences. This result showed there was significant improvement in the performance of the participants' cardiovascular abilities.

The standard norms for 12 minutes run test for male athletes whose age ranges from 17 to 19 was compared with the study result. Standard norms for this test ranges from 2700 – 3000 meters (Cooper, 1968) while the study result was found to be 2843.46 meters in 12 minutes run. Hence, the result of this finding was **appropriate to the standard.**

The result of this finding was consistent with the finding of Okuneye and his friends, who Conducted the study on The Effects of a Six-Week Aerobic Dance Programme on Selected Fitness Components and Waist-Hip-Ratio in Adult Male .Their study Results revealed that a sixweeklow impact aerobic dance programme can significantly reduce the waist-hip-ratios, improve trunk flexibility, leg power and abdominal endurance/strength in male undergraduate students (Okuneye et al., 2010). Similarly Mills and Mae (1994) who examined the effect of low intensity aerobic exercise program on muscle strength and flexibility of the lower extremities and found significantly greater flexibility of ankle and the right knee than the comparison group.

Table 4.5. The Mean Values of Push Up test results of pre, during and after 12 weeks aerobic exercise.

Control group				Experimental group			
	Var	PT	DTT	PoT	PT	DTT	PoT
5	PU	17.55+2.87411	21.35+3.06551	28+1.94666	17.4+2.87274	23.6+2.92719	30.9500+2.74293

Values are in the form of Mean \pm SD, PT= pre training test which was taken before aerobic exercise, DT=during training test which was measured at 6th week of aerobic exercise, POT= posttest which was taken after 12th week of aerobic exercise training, Var= Variables, PU = pushups.

The mean values of control group in pushups of pre training test results was 17.55+2.87411, during training result of pushups mean value was 21.35+3.06551 (Standard deviation) and post training test results after twelve weeks exercises was 28+1.94666. The same parameters for experimental group of push up test of pre training test results was 17.4+2.87274, during training result of pushups mean value was 23.6+2.92719 (Standard deviation) and post training test results after twelve weeks exercises was 30.9500+2.74293. When we compare the mean value of pushups performances for experimental group of pre training test results with post test results of the participants after twelve weeks of exercises were improved by 13.55 \pm 2.37254 mean differences and standard deviation.

The result of pushups for the study subjects was compared with that of an international standard test norm for age group ranges from 15 to 19 years. The international standard test norms ranged from 29 to 38 pushups, number per minutes (Golding, *et al.*, 1986) while this study has demonstrated the finding to 33.5 pushups (number per minutes) for the same age groups. Therefore, the result of this study is relatively in a **good standard**.

Table 4.6: The Mean Difference Values and Significance level of each test results of both groups.

No	Dependent Variable	Para I	Para II	MD(II-I)		Sig	
				EG	CG	EG	CG
1	BMI (kg/m ²)	PT(EG) 19.935±1.03 988	PoT(EG)20±.89560	.065		.641	
		PT(CG) 20.1±1.3564 7	PoT(CG)20.68±1.2844 3		.58		.001
2	Sit and reach	PT(EG) 8.35±1.1367 1	PoT(EG)13.85±1.4608 9	5.5		.000	
		PT(CG) 8.2±1.19649	PoT(CG)10.8±.89443		2.6		.000
3	Sit up	PT(EG) 17.8±.76777	PoT(EG)25.15±1.8432 0	7.35		.000	
		PT(CG) 17.4±.88258	PoT(CG)19.8±1.10501		2.4		.000
4	TMR	PT(EG) 2150.9+230. 70850	PoT(EG)2418.600+190 .56492	267.7		.000	
		PT(CG) 2190.9+261. 87400	PoT(CG)2278.35+278. 60598		87.45		.000
5	Push up	PT(EG) 17.4+2.8727 4	PoT(EG)30.9500+2.74 293	13.55		.000	
		PT(CG) 17.55+2.874 11	PoT(CG)28+1.94666		10.45		.000

MD=Mean Difference PT = pre training test which was taken before aerobics training, , PoT= posttest which is taken after 12th week of aerobic exercise training.

Table 4.6: Showed the overall result of each test.it includes the mean difference from one test to another and the significance of post tests in reference to the pre tests. Body

weight was increased in both groups. More significant improvement was recorded in the experimental group. This was due to the aerobics exercise both groups engaged in. however, more significant change in the EG was an evident for the positive effect of aerobics on BMI, flexibility, muscular endurance, cardiovascular endurance and also muscular strength.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The purpose of this study was to find out the effects of aerobic exercises on the improving of health related physical fitness components of Ambo town U-17 male football project trainees.

- To achieve the purpose of this study all 40 U-17 Ambo town male football project were selected of the age group of 15-17years.
- The exercise program was designed for 12 weeks, three times per week with 60 minute duration low and moderate intensity. Each session was divided again in to warming up, main part(aerobic exercise stretching) and cooling down phase. The data collected from the study was analyzed using SPSS version 20 software .
- 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 BMI,sit and reach,sit up,TMR and Push up increased among the participants due to the program and highly significant change were observed in improvement of BMI, flexibility,muscular endurance, cardiovascular endurance and also muscular strength.
- Additionally The paired sample t-test was used to compare the mean value of pre test and post tests of this study. Based on the result analysis made, at the end of the study significant improvements were observed in BMI, flexibility,muscular endurance, cardiovascular endurance and muscular strength performance of the study subjects. In step test result a heart beats was reduced, because it shows improvement on the performance of the study subjects.

5.2. Conclusions

Based on the major finding of the study, the following points are stated as conclusion Moderate aerobic exercise has positive effect on improvement of flexibility, muscular endurance,cardiovascular endurance and muscular strength of U-17 Ambo town male football project.

- The aerobic exercise shows significant increament on BMI, flexibility,muscular endurance, cardiovascular endurance and also muscular strength of the players.
- Low and Moderate aerobic exercise has significant effects on improvement of health related physical fitness components on BMI, flexibility,muscular endurance,cardiovascular endurance and also muscular strength.
- Everyone who participated in aerobic exercises has got an improved cardiovascular fitness; get strong, flexible, proportional fat and lean tissue.
- Aerobic exercise program had effects on the performance of subjects' flexibility,muscular endurance, cardiovascular endurance and also muscular strength test results a heart beats was reduced, because it shows improvement on the performance of the study subjects.

5.3. Recommendations

Based on the findings of this study the following recommendations are made:

- The Mean value of Sit and Reach for experimental group PT was 8.35 ± 1.13671 and PoT was 13.85 ± 1.46089 . The Mean difference of PT and PoT was 5.5. this showed that there was a significant change on flexibility.
- The Mean value of Sit up for experimental group PT was 17.8 ± 1.76777 and PoT was 25.15 ± 1.84320 . The Mean difference of PT and PoT was 7.35. this showed that there was a significant change on muscular endurance.
- The Mean value of TMR for experimental group PT was 2150.9 ± 230.70850 and PoT was 2418.600 ± 190.56492 . The Mean difference of PT and PoT was 267.7. this showed that there was a significant change cardiovascular endurance.
- The Mean value of Push up for experimental group PT was 17.4 ± 2.87274 and PoT was 30.9500 ± 2.74293 . The Mean difference of PT and PoT was 13.55. this showed that there was a significant change on muscular strength.
- Generally the results showed that there were significant changes on BMI, flexibility, muscular endurance, cardiovascular endurance and also muscular strength; this is because of 12 weeks of aerobic exercise training-
- The Investigator of this study recommends that the Ambo town Sport and Youth Office may give due attention and proper management for the project trainees, so that the trainer and the trainees could work harmoniously and cooperatively for a good result.
- The National and Regional Football Federation should create a forum for seminar and workshop on various aerobic exercise programmes and their importance and benefit to health.
- The investigator also recommends that other investigators could conduct a research on the same topic or related topic for new findings.

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7.2. Appendix II

Participants information sheet and informed consent form

Researcher's Name: Tilahun Bikila

Supervisor's Name: Desta Enyew (PhD)

Abinet Ayalew (PhD)

Thesis title: "Effect of selected aerobic exercises on health related physical fitness components: the case of Ambo Town U-17 male football project trainees; Ambo Town, Oromia Regional State, Ethiopia"

Purpose of the study"

Purpose of this study is to examine the Effects of selected aerobic exercises on health related physical fitness components: the case of Ambo town U-17 male football project trainees Ambo Town, Oromia Regional State, Ethiopia.

Procedure and duration

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 regarding 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 you choose to do so.

Risks and benefits:

The risks of this research study are small. While administering the tests and during training session you may experience localized muscle fatigue in your muscles. 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.

Confidentiality:

The information obtained about you will be kept in confidence, 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.

Rights:

Participation for this study is fully voluntary. You have the right to declare to participate or not in this study. If you decide to participate, you have the right to withdraw from the study at any time and this will not label you for any loss of benefits which you otherwise are entitled. You do not have to answer any question that you do not want to answer.

Contacts address:

If there is any questions or enquires any time about the study or the procedures, please contact: Tilahun Bilikla +251911398581 ,Department of Sport Science, +251255530387

E- mail: tilamo8888@gmail.com. If you have any questions on your rights as a research subject, you can call the Institutional Research Ethics Review Committee (IRERC) at (+251) 256-66-18-99 or P.O.BOX 235, Harar.

Appendix- III

A. Health Related Physical Fitness Components and Fitness Test Record Sheet

Name _____ Height _____

Weight _____ Age _____

Sex _____ Date _____

Table.1. Fitness test record sheet

Test Code	Parameter to be measured	Types of test	Unit	EG			CG		
				PT	DT	PoT	PT	DT	PoT
T 1	BMI	BMI	Kg/h ²	19.93 5	19.87 5	20	20.1	20.31	20.685
T 2	F	Sit and reach	Cm	8.35	10.8	13.85	8.2	8.75	10.8
T 3	ME	Sit up	Rep/ m	17.8	20.6	25.15	17.4	18.3	19.8
T 4	CVE	TMR	Dis/m	2150. 9	2272. 65	2418.6	2190.9	2198.8	2278.35
T 5	MS	Push up	Rep/ m	17.4	23.6	30.95	17.55	21.35	28

N.B:- BMI(Body composition), F (Flexibility) ME (Muscular endurance),

CVE (Cardiovascular endurance),MS (Muscular Strength)

7.3. Appendix- IV-

Paired Sample T test Results of each Parameter

1. Paired T test results of BMI

	Tests	Mean	Md	SD	Se	Lower Bound	Upper bound	T value
Cg	Pt-dt	20.1-20.35	.150	.366	.082	-.021	.321	1.831
	Pt-pot	20.1-20.68	.600	.503	.112	.365	.835	5.339
Eg	Pt-dt	19.935-19.8750	.700	.470	.105	.480	.920	6.658
	Pt-pot	19.935-20	1.500	.513	.115	1.260	1.740	13.077

2. Paired T test results of sit and reach

	Tests	Mean	Md	SD	SE	Lower Bound	Upper bound	T value
Cg	Pt-dt	8.2-8.75	3.350	1.137	.254	2.818	3.882	13.180
	Pt-pot	8.2-10.8	7.000	1.376	.308	6.356	7.644	22.743
Eg	Pt-dt	8.35-10.8	5.300	.865	.193	4.895	5.705	27.417
	Pt-pot	8.35-13.85	14.100	1.714	.383	13.298	14.902	36.795

3. Paired T test results of sit up

	Tests	Mean	Md	Sd	Se	Lower Bound	Upper Bound	T value
Cg	Pt-dt	17.4-18.3	3.700	1.031	.231	3.27	4.183	16.048
	Pt-pot	17.4-19.8	8.450	1.638	.366	7.684	9.216	23.077
Eg	Pt-dt	17.8-20.6	6.300	1.455	.325	5.619	6.981	19.370
	Pt-pot	17.8-25.15	16.350	2.207	.494	15.317	17.383	33.130

3. Paired T test of Push Up

	Tests	Mean	Md	Sd	Se	Lower Bound	Upper Bound	T value
Cg	Pt-dt	17.55-21.35	3.8	1.70448	.38113	3.00228	4.59772	9.970
	Pt-pot	17.55-28	10.45	2.76205	.61761	9.15732	11.74268	16.920
Eg	Pt-dt	17.40-23.6	6.2	1.60918	.35982	5.44688	6.95312	17.231
	Pt-pot	17.40-30.95	13.55	2.37254	.53052	12.43962	14.66038	25.541

4. Paired T test of Twelve Minutes Run

	Tests	Mean	Md	Sd	Se	Lower Bound	Upper Bound	T value
Cg	Pt-dt	2190.9-2198.8	7.9	87.59110	19.58596	33.09389	48.89389	.403
	Pt-pot	2190.9-2278.35	87.45	84.31237	18.85282	47.99059	126.90941	4.639
Eg	Pt-dt	2150.9-2272.65	121.75	77.76339	17.38842	85.35561	158.14439	7.002
	Pt-pot	2150.9-2418.6	267.7	119.50120	26.72128	211.77172	323.62828	10.018

7.4. Appendix-V

Description of Resistance Training and Intensity Plan

Intensity

The final and most difficult aspect of the exercise prescription to write is intensity. The intensity should be specifically tailored to the performance goals. The optimal intensity for aerobic exercise training occurs between 50% to 85% of the functional aerobic capacity (VO₂max). Exercise intensity can be prescribed by several methods, the most popular of which are utilization of the target heart rate; calculated VO₂max; or category-ratio scales for rating of perceived exertion.

In most cases it is not feasible to directly measure oxygen uptake in patients. Studies show that heart rate and oxygen uptake are linearly related during peak exercise. Thus heart rate monitoring has become widely accepted as an indicator of exercise intensity. The recommended target heart rate (THR) should be 65% to 90% of maximum heart rate (MHR). This heart rate range is for improvement/maintenance of VO₂max. Health-related benefits may be seen at lower heart rate ranges. This method of calculating THR has come under some scrutiny because the variability of age-predicted heart rate maximums. Furthermore, recent data suggest the use of the “220 minus the patient’s age” formula significantly underestimates the MHR, especially in the elderly population.

The alternate method to calculate THR employs the use of heart rate reserve (HRR) – the Karvonen equation. First, calculate the MHR. Women subtract their age from 220 and men subtract one-half their age from 205. The second step is to determine the resting heart rate (RHR). Third, calculate the HRR. The HRR is MHR minus RHR. Lastly, the THR is the product of training intensity (TI), generally 60% to 80%, multiplied by the HRR then adding the RHR.

$$[\text{THR} = (\text{MHR} - \text{RHR}) \times \% \text{TI} + \text{RHR}]$$

Exercise Prescription

For example, what is the THR for a 40 year old male with a RHR of 60 who is to exercise between 70% and 80% TI? His MHR is 205 minus 40 divided by 2, which equates to 185 beats per minute (BPM). Thus his HRR is 185 (MHR) minus 60 (RHR) which is 125 BPM. Seventy percent TI equals 0.7 (TI) multiplied by 125 (HRR) plus 60 (RHR). This figure calculates to 147.5 BPM. Eighty percent TI when calculated using the same formula yields 160 BPM. Thus this individual would have a THR ranging from 148 to 160 BPM. When a THR is calculated, the patient should be taught to monitor their heart rate at various stages of exercise. The easiest pulse to press is the carotid artery. Caution patients, specifically older individuals not to palpate hard when counting their pulse. In order to calculate beats per minute a patient counts their pulse for 15 seconds and then multiplies this figure by 4. Alternatively, the radial artery can be utilized. Commercial heart rate monitors are available for interested patients. Intensity can also be judged as a rating of perceived exertion (RPE), which can be equated to desirable heart rate during individual activities.

The original scale introduced by Borg in the early 1960's is a 15 grade category scale ranging from 6 to 20, with a verbal description at every odd number that is an important adjunct to heart rate monitoring during training. The RPE scale provides valuable information related to the amount of strain or fatigue the patient is experiencing during exercise. The original scale was validated in a young population to represent the actual heart rate at a given level of work. Unfortunately, heart rate maximums decline with age and therefore actual heart rates and RPE do not match. Despite these findings, the linear relationship between heart rate and work intensity remains for individuals at all ages.

The following rating of perceived exertion values should be followed:

Less than 12 - light, 40% to 60% of maximal

12 to 13 - somewhat hard (moderate), 60% to 75% of maximal

14 to 16 - hard (heavy), 75% to 90% of maximal

Muscle Conditioning

A comprehensive exercise prescription should contain instructions on muscular endurance and muscular strengthening. Muscular endurance is best developed by utilizing lighter weights with greater number of repetitions, while muscular strengthening, which uses heavier weights with fewer repetitions. Muscle conditioning can be accomplished best by means of static (isometric) or dynamic (isotonic or isokinetic) exercises. Resistance training for the average individual should be performed at rhythmical, slow to moderate speed through a full range of motion utilizing the major muscle groups.

In resistance training, 8 to 10 repetitions of each exercise should be performed or until volitional fatigue (if prior to minimum number of repetitions). Different muscle groups should be used and exercises performed 2 to 3 times per week. Small hand-held weights or wrist/ankle weights can be utilized as a means of resistance training. Most gymnasiums are staffed by weight trainers who can assist patients develop a weight training program.

Muscle Size and Structure

Resistance training increases muscle size and strength. The increase in the cross-sectional area (CSA) of the whole muscle reflects an increase in the individual muscle fiber cross-sectional area. The increased cross-sectional area of the muscle results from hypertrophy of all three muscle fiber types, although the fast-glycolytic (FG) fibers appear to have the greatest increase (Bird *et al.*, 2005). The hypertrophy that occurs is due to an increase in the total contractile protein (actin and myosin), in the size and number of the myofibrils per fiber, and in the amount of connective tissue surrounding the muscle fibers (Rogers and Evans, 1993; Folland and Williams, 2007). Resistance training appears to cause a conversion of FOG fibers to FG fibers in humans.

Application of the training principles

The training principles for a safe and effective resistance training program are the same as for other types of exercise programs

Specificity

As in any training program, a plan for muscular fitness must be specific to the individual's goals. Individuals may pursue resistance training as part of a comprehensive fitness program to improve overall health, to enhance functional capacity, or to improve athletic performance. For muscular fitness, the goals of a resistance training program may include the development of muscular strength, hypertrophy, power, muscular endurance, or any combination of the above. Of course, these goals overlap. A person who gains muscle mass (hypertrophy), for example, is certainly stronger. However, the resistance training program should emphasize the goal that is most important to the individual.

Overload

Successfully applying the overload principle in resistance training requires the manipulation of intensity (load), volume, frequency, and rest intervals. The intensity of the workout can be expressed as a relative load (a percentage of an individual's 1-RM) or an absolute load (a specific amount of weight)

Progression

Once the body has adapted to the current training level, exercise stress should be increased following the overload principle if further adaptations are desired. This principle is the basis of progressive resistance exercise.

Rest/Recovery/Adaptation

Muscles adapt to the stress placed on them. The most obvious changes that result from a resistance training program are increased muscle strength and size. However, the extent to which muscles adapt to training by becoming stronger and bigger depends on

the training program that is followed. For example, at some point during a resistance training program, individuals will realize that their initial 10-RM can now be lifted more than 10 times.

Warm-Up and Cooldown

A proper warm-up raises body temperature and is often recommended to prevent injury and muscle soreness. Although a warm-up has not been conclusively proven to decrease the incidence of injury, some evidence is consistent with this theory. A higher temperature decreases the viscosity of the joint capsule and increases the speed of muscle contraction and relaxation and enzymatic reactions.

Source: Plowman, Sharon A. Exercise physiology for health, fitness, and performance

—3rd ed. WE 103 P732e 20

Appendix-V

Training Schedule of Three Months

1. Month one (October, 2017)

Date	Types of selected Exercises	Duration (Min)	Repetition	Set	Rest	Intensity
Monday	Warming up Exercise	10	-	-	3 min	Low (40%-60%)
	split squat jumps	15	4	2		
	single leg vertical jump	15	4	2		
	lateral jump to box	10	4	2		
	cooling down Exercise	7	-	-		
Wednesday	Warming up Exercise	10	-	-	3 min	Low (40%-60%)
	split squat jumps	15	4	2		
	lateral jump to box	15	4	2		
	single leg vertical jump	10	4	2		
	cooling down Exercise	-	-	-		
Friday	Warming up Exercise	10	-	-	3 min	Low (40%-60%)
	split squat jumps	15	4	2		
	lateral jump to box	15	4	2		
	single leg vertical jump	10	4	2		
	cooling down Exercise	-	-	-		

2. Month Two (November, 2017)

Date	Types of selected Exercises	Duration (Min)	Repetition	Set	Rest	Intensity
Monday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	6	2		
	single leg vertical jump	15	6	2		
	lateral jump to box	10	6	2		
	cooling down Exercise	7	-	-		
Wednesday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	6	2		
	lateral jump to box	15	6	2		
	single leg vertical jump	10	6	2		
	cooling down Exercise	7	-	-		
Friday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	6	2		
	lateral jump to box	15	6	2		
	single leg vertical jump	10	6	2		
	cooling down Exercise	7	-	-		

3. Month Three (December, 2017)

Date	Types of selected Exercises	Duration (Min)	Repetition	Set	Rest	Intensity
Monday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	8	2		
	single leg vertical jump	15	8	2		
	lateral jump to box	10	8	2		
	cooling down Exercise	7	-	-		
Wednesday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	8	2		
	lateral jump to box	15	8	2		
	single leg vertical jump	10	8	2		
	cooling down Exercise	7	-	-		
Friday	Warming up Exercise	10	-	-	3 min	Mod (60%-75%)
	split squat jumps	15	8	3		
	lateral jump to box	15	8	3		
	single leg vertical jump	10	8	3		
	cooling down Exercise	7	-	-		

7.6. Appendix-VII

Norms

1. Normative data for the sit ups test

The following are national norms for 16 to 19 year olds.

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>30	26-30	20-25	17-19	<17
Female	>25	21-25	15-20	9-14	<9

Reference: Davis B. et al; 2000

2. Normative data for the sit & reach test

The following are national norms for 16 to 19 year olds.

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	>14cm	11-14cm	7-10cm	4-6cm	<4cm
Female	>15cm	12-15cm	7-11cm	4-6cm	<4cm

Reference: Davis B. et al; *Physical Education and the Study of Sport*; 2000

3. Standard norms of body mass index

BMI (kg/m ²)	Classification
< 18.5	Under Weight
18.5 – 24.9	Healthy Weight
25.0 – 29.9	Over Weight
30.0 – 39.9	Obesity

Source: WHO, 2012

4. Standard Norm of twelve minute run

Age	Excellent	Above Average	Average	Below Average	Poor
13-14	>2700m	2400-2700m	2200-2399m	2100-2199m	<2100m
15-16	>2800m	2500-2800m	2300-2499m	2200-2299m	<2200m
17-19	>3000m	<u>2700-3000m</u>	2500-2699m	2300-2499m	<2300m
20-29	>2800	2400-2800m	2200-2399m	1600S-2199m	<1600m
30-39	>2700	2300-2700m	1900-2299m	1500-1999m	<1500m
40-49	>2500	2100-2500m	1700-2099m	1400-1699m	<1400m
>50	>2400	2000-2400m	1600-1999m	1300-1599m	<1300m

Source (Topend sports.com).

5. Norms of Pushups Test for Men (in one minute)

Age	15-19	20-29	30-39	40-49	50-59
Excellent	>39	>36	>30	>22	>21
Good	29-38	29-35	22-29	17-21	13-20
Average	23-28	22-28	17-21	13-16	10-12
Fair	18-22	17-21	12-16	10-12	7 – 9
Poor	< 17	< 16	< 11	< 9	< 6

Sources: (Golding *et al.*, 1986)

7.7. Appendix-VIII

Raw Data

A .Raw Data for Experimental Group

Table 1. Raw Data of BMI for Experimental Group

code of the subjects	Pre-test	During – test	Post – test
1	20.3	20.3	19.9
2	21.6	22	21.6
3	21.9	21.9	21
4	20.8	20.4	20.4
5	21	21	21
6	19.5	19.1	19.1
7	19.3	19.3	19.3
8	20	20	20
9	20.5	19.3	19.3
10	20	19.6	19.6
11	19.8	21	21
12	19.1	19.5	19.9
13	20.8	20.8	21.3
14	19.7	19.3	19.7
15	19.5	19.1	19.1
16	18.1	18.1	18.9
17	18.3	18.3	19.1
18	18.6	18.6	19
19	20.8	20.8	21.3
20	19.1	19.1	19.5
Mean Value	19.935	19.875	20

Table 2. Raw Data of Sit and Reach Test for experimental group

code of the subjects	Pre-test	During – test	Post – test
1	8	10	14
2	9	12	15
3	10	13	16
4	7	10	12
5	7	9	12
6	8	10	13
7	9	11	14
8	10	12	15
9	7	9	11
10	7	9	11
11	8	10	13
12	9	12	14
13	10	12	15
14	8	10	14
15	9	12	15
16	10	12	14
17	7	10	15
18	7	10	16
19	8	11	14
20	9	12	14
Mean Value	8.35	10.8	13.85

Table 3. Raw Data of Sit up Test for Experimental Group

code of the subjects	Pre-test	During – test	Post – test
1	18	20	26
2	17	19	26
3	19	22	27
4	18	23	28
5	17	23	24
6	18	20	25
7	17	19	25
8	19	21	25
9	18	21	26
10	17	19	24
11	18	19	24
12	17	20	19
13	19	22	25
14	18	21	25
15	17	21	24
16	18	20	25
17	17	20	25
18	19	23	27
19	18	20	27
20	17	19	26
Mean Value	17.8	20.6	25.15

Table 4. Raw Data of Twelve Minute Run Test for Experimental Group

code of the subjects	Pre-test	During – test	Post – test
1	1900	2002	2235
2	2506	2623	2705
3	2000	2138	2390
4	2201	2312	2467
5	2100	2300	2400
6	1800	1932	2005
7	2200	2109	2312
8	1900	1960	2187
9	2001	2215	2412
10	2403	2507	2662
11	2473	2607	2562
12	2204	2276	2300
13	2211	2387	2512
14	2001	2312	2587
15	2354	2443	2575
16	1739	1856	2112
17	2235	2409	2512
18	2530	2653	2662
19	2019	2112	2300
20	2241	2300	2475
Mean Value	2150.9	2272.65	2418.6

Table 5. Raw Data of Push Up Test For Experimental Group

code of the subjects	Pre-test	During – test	Post – test
1	13	19	25
2	20	26	33
3	19	26	29
4	17	24	30
5	15	20	29
6	20	26	32
7	17	23	30
8	15	21	29
9	16	25	33
10	20	25	32
11	21	28	37
12	25	28	34
13	16	23	29
14	16	20	30
15	17	25	34
16	13	19	28
17	18	23	29
18	15	20	32
19	18	24	30
20	17	27	34
Mean Value	17.4	23.6	30.95

B. Raw Data for Control Group

Table 1. Raw Data of BMI for Control Group

code of the subjects	Pre-test	During – test	Post – test
1	18.3	18.6	19.4
2	18.6	19.0	21.0
3	20.8	21.7	22.2
4	19.5	19.1	19.1
5	22.6	22.6	22.6
6	20.4	20.8	20.8
7	18.0	18.4	18.9
8	18.4	18.8	19.2
9	19.8	20.6	20.6
10	20.3	20.3	20.8
11	22.2	23.1	23.1
12	20.8	21.2	20.8
13	19.1	19.5	20.3
14	20.9	20.5	20.9
15	22.4	22.8	22.8
16	19.8	19.4	19.8
17	20.8	21.3	21.7
18	20.9	20.5	20.9
19	19.5	19.5	19.5
20	18.9	19.3	19.3
Mean Value	20.1	20.35	20.685

Table 2. Raw Data of sit and reach test for control group

code of the subjects	Pre-test	During – test	Post – test
1	7	8	10
2	7	9	11
3	8	9	11
4	9	8	11
5	10	10	12
6	7	7	10
7	7	8	11
8	8	8	11
9	9	9	12
10	10	11	13
11	7	8	10
12	7	10	10
13	8	9	10
14	9	9	11
15	10	10	12
16	7	8	10
17	7	7	10
18	8	8	10
19	9	9	10
20	10	10	11
Mean Value	8.2	8.75	10.8

Table 3. Raw Data of sit up test for control group

code of the subjects	Pre-test	During – test	Post – test
1	17	18	19
2	17	18	20
3	18	19	20
4	18	18	20
5	17	18	19
6	16	17	19
7	17	18	20
8	19	19	21
9	18	19	20
10	16	17	19
11	18	19	19
12	16	17	19
13	17	18	19
14	18	19	20
15	17	18	19
16	18	18	20
17	17	18	19
18	19	19	19
19	18	19	23
20	17	20	22
Mean Value	17.4	18.3	19.8

Table 4. Raw Data of twelve minute run test control group

code of the subjects	Pre-test	During – test	Post – test
1	1739	1750	1895
2	2135	2200	2305
3	2570	2612	2730
4	2679	2680	2787
5	2241	2312	2390
6	2443	2512	2580
7	2284	2237	2312
8	2261	2200	2257
9	2001	2125	2182
10	2354	2375	2402
11	1800	1875	1912
12	2200	2212	2280
13	1900	1825	1812
14	2031	1900	2087
15	2473	2300	2475
16	1900	1937	1912
17	2506	2537	2612
18	2000	1975	2062
19	2201	2112	2200
20	2100	2300	2375
Mean Value	2190.9	2198.8	2278.35

5.Raw Data of push up test control group

code of the subjects	Pre-test	During – test	Post – test
1	21	23	25
2	25	29	33
3	16	19	26
4	16	20	26
5	17	23	27
6	14	18	27
7	18	23	29
8	15	20	30
9	18	24	30
10	18	23	31
11	13	16	27
12	20	20	27
13	19	23	26
14	19	20	28
15	14	20	27
16	20	24	28
17	17	22	29
18	15	16	27
19	16	20	28
20	20	24	29
Mean Value	17.55	21.35	28

7.8. Appendix – IX

List of Figures

Figure 1: Map of the study Site



Source: Map data@2017 Google