ADDIS ABABA UNIVERSITY

COLLEGE OF EDUCATION AND BEHAVIORAL STUDIES

DEPARTMENT OF SCIENCE AND MATHMATICS EDUCATION

THE EFFECT OF TEACHING AEROBIC EXERCISE ON PERFORMANCE RELATED PHYSICAL FITNESS COMPONENTS OF STUDENTS: THE CASE OF URAGA PREPARATORY SCHOOL IN GUJI ZONE, OROMIA REGION

By

TESFAHUN HAILU

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This is to certify that a thesis submitted by Tesfahun Hailu entitled **"*The Effect of Teaching Aerobic Exercise on selected Performance Related Physical Fitness components of Students: The Case of Uraga Preparatory School in Guji Zone, Oromia Region*"** was approved through complies with the regulation of the university and meets the accepted standards with respect to originality and quality.

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Advisor _____Signature _____Date_____

Co-advisor_____Signature_____Date_____

_____

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Abstract

The effect of teaching aerobic exercise on selected performance related physical fitness components of students: the case of Uraga preparatory school in Guji zone, Oromia region

Tesfahun Hailu

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The study was conducted to investigate the effect of teaching aerobic exercise on performance related physical fitness components of students: the case of Uraga preparatory school in Guji zone, Oromia region. The research design was quasi-experimental with pre-post test none equivalent design. 63 students from Uraga preparatory school were selected as study subjects and their age range were16-19 years. 30 students were under experimental group and the remaining 33 students were under control group. Students in the experimental group were participated in low, moderate and high intensity aerobic exercise for 12 consecutive weeks, i.e.3 days per week 40 minute duration per day. Pre and post training tests were conducted on the selected four components of skill related physical fitness variables. The data collected from the study subject was analyzed using SPSS version 20.0 software. The data pertaining to agility, balance, power and speed as a component of performance related component were analyzed by paired sample 't' test to determine the difference between initial and final mean for participant. And also to compare the difference between experimental and control group the independent t-test was computed. The significance value was checked at p-value < 0.05. The mean difference between the post and pre test results of the four performance related fitness components was significant in experimental groups but this difference is not significant in control groups. This shows that the effect of aerobic exercises on the improvement of performance related fitness components. There is a significant mean difference between post and pre test results of agility, balance, power and speed in experimental groups but there is no significant mean difference in control groups. This shows that the positive effect of aerobic exercises in each selected skill related fitness components. Based on this finding, it can be conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of skill related fitness components. According to the research finding aerobic exercises have a positive effect on agility, balance, power and speed. So Students, athletes and other sport men's, who want to improve skill related fitness components focused more on aerobic exercises than other activities.

Key Terms- *Aerobic exercise, skill related fitness components, physical fitness, fitness, Agility, Power*

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Acronym

AAHPERD- American Alliance of Health, Physical Education, Recreation and Dance

ACSM- American College of Sport Medicine

BMI- Body Mass Index

CDC- Centers for Diseases Control and prevention

DF- degree of freedom

MOE: minster of Education

NSCA- National Strength and Conditioning Association

PCPFS- President's Council for Physical Fitness and Sports

WHO- World Health Organization

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CHAPTER ONE

1.INTRODUCTION

This chapter represents the basic aspects that could give essential information on the general knowledge of the study. It also highlights pertaining to what the problem is about, identifies the significance and limitation of the study and follows the organization of the study.

1.1 Background of the study

Physical fitness signifies the body's ability to work efficiently and effectively during school hours and at leisure time. A physically fit person is someone who will remain healthy and lead an active lifestyle. Also being physically fit allows a person to safeguard his/her body against diseases and live a longer healthier life. Physical Education must do more to prepare and motivate students to engage in physical activity outside of school, and throughout their lives. Although a focus on fitness in physical education is not a new idea, current approaches to fitness education should be directed at developing lifetime physical activity habits (Lund & Tannehill, 2010). The relationship between a healthy life and regular exercise is undeniable. Let as consider the fact that, for example; that exercisers have an all cause mortality rate that is less than one-third that of non-exercisers. Moreover, some forms of regular physical activity, even if it is very mild form of activity, of low and moderate amounts of physical activity, can also have beneficial health results (Carbin, Lindsey, Welk and Corbin, 2002).

Many research works including Hadfield, (2000); Diamond, (2001) and Carbin, et al.., (2002), have shown that numerous health benefits have been ascribed to physical exercise. These are:- Regular physical activity can lower the risk of disability and death from heart disease,

helps to strengthen the cardio-vascular system, maintain normal blood pressure, decrease blood cholesterol, increase toleration of stress and maintain weight. it increases the energy level of the individual for work and play, leads to improved sleep, strengthens the body, better enabling it to cope up with illness or accidents, increases the ability to withstand fatigue, improves concentration, alertness, improves posture and enhances body appearance, improves individual's mental health, reduce anxiety, help to alleviate depression, increases feeling of accomplishment work, increases productivity and decreases health cost etc.

As cited from **www.mhhe.com/uncw.edu/career PE.htm/** retrieved on September 21 2016, in most educational system, physical education (physical training) is a course in the curriculum which utilizes learning in the cognitive, affective and psychomotor domain in a play or movement exploration setting. Overall, a rapidly growing body of work suggests that time spent engaged in physical activity is related not only to a healthier body but also to a healthier mind. For instance, in the United States, physical education is almost always mandatory for students in elementary school, and even for students in the middle and high schools. Its aim is to equip learners with skills, capacities, and values along with the enthusiasm to maintain a healthy lifestyle into adulthood. The primary aim of physical education is to equip students with the knowledge, skills, capacities and values along with the enthusiasm to maintain a healthy lifestyle into adulthood. Some schools also require physical education as a way to promote weight loss in students. Activities included in the program are designed to promote physical fitness, to develop motor skills, to instill knowledge and understanding of rules, concepts, and strategies, and to teach students to work as part of a team, or as individuals, in a wide variety of competitive activities.

Alex (2006) stated that the purpose of all curriculum planning is to provide opportunities for an individual student or groups of students

to benefit maximally from participation in learning activities. The role played by the teacher in the implementation of a curriculum is one of the factors that influence the quality of education. In Ethiopia's educational system, Physical education is one of the subjects included in the secondary schools and the syllabus with general objectives has been developed for it. However, due to some shortcomings, of which, it was not possible to achieve the objectives. Hence the shortage of curriculum materials, lack of quality teachers, lack of playgrounds, lack of budget compared to its value and needs, lack of competence to teach and in adequate refreshment training for teachers are among the major problems.

The goals of physical education for secondary schools are improving physical health and develop a good attitude towards various physical activities that will result in lifetime participation in physical activities (MoE, 2003).

According to Rao (2003:268) institutions of Health Education have the main responsibility for equipping individuals with advanced knowledge and skills required for positions of responsibility in government and academic areas. These institutions produce new knowledge through research and disseminating this knowledge. Health education modern society seeks to preserve transmit and advance knowledge and it committed to change. Therefore, the importance of teaching as instruments of change and progress had been underlined by various educational expert, committee and commission. To achieve the goal of physical education subjects the teaching and learning process should take place by implementing different and various teaching methodology and the class room teachers should be equipped with different teaching methodology for health related fitness that makes teaching and learning more live.

A variety of strategies or practical teaching method can be used to help students understand cardiovascular endurance fitness concepts and increase participation in moderate to vigorous physical activity.

Most physical educators agree that cardiovascular endurance fitness is an important element for students overall health and well-being (Ratliffe, 1994).

Regular physical activities 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).

Regular aerobic exercise produces 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 (Rosser, 2001).

Now days in our country Ethiopia, Secondary schools are scarce of implement, produce and increase of different practical teaching or training for aerobic exercises, shortage of teaching material in quality and quantity those are very use full to practice aerobic exercises for physical fitness components, problems related with ability of teachers, the school environment, improper use of training or teaching method, narrow sport field in different schools and crowdedness of the field conditions are challenges on aerobic exercise practical teaching or training method.

In spite of this reality the Guji zone Uraga preparatory school faces similar fashion of problem or deprived by effective use of aerobic exerc ises in terms of quality and quantity as well as their practical implementation to provide teaching strategies or method and specific activities that enhance opportunities for students to learn about and engage in performance or skill related fitness activities within a physical education. Therefore, the purpose of the study will be

investigating the effect of aerobic exercises on performance related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State.

1.2 Statement of the problem

Fitness for living in the house or on the farm or at office or factory or in work places or in any service implies freedom from disease, enough strength, endurance, power and other abilities to meet the demands of daily living. Doing physical activity everyday contributes to optimum health and quality of life. Life styles can be changed to improve health and fitness through daily exercises. Aerobic exercise stimulates heart, lungs and all working group of muscles and produces valuable changes in body and mind. Many physiological changes are determined by daily aerobic exercises (Shahana, 2010).

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

Nowadays, physical exercise is a non-pharmacological treatment of modern and busy lifestyle around the world. Although, many studies believe that regular physical activity can have immediate health benefits by positively affecting body composition and musculoskeletal development for male and female. But the reality in our country as well as at Uraga preparatory School shows the value of improving skill related physical fitness by aerobic exercise has been known theoretically not practically. Beside this, student's participation in physical activity is at minimum level regard to our country and they

are not beneficial from regular physical activity because of improper implementation of aerobic exercises practically.

Skill related physical fitness are developed through different aerobic exercises such as swimming, cycling, tennis playing, treadmills, stationary bike or bicycle ergo meter and resistance machine exercises that improve fitness in the gymnasium and this methods of developing fitness need high cost. These methods of training are impossible to implement in secondary school level. However active aerobic activities such as brisk walking, jogging, running; aerobic dancing, ball games, and other sports exercises that improving fitness in the field and without gymnasium additionally essay to implement in high school setting.

In addition to the above idea numerous researches have been done on the effect of aerobic exercises on health related physical fitness components. For instance, a study conducted by Mr. Mathewos Hosiso (2013) on the Effects of Aerobic Exercise on Improving Health Related Physical Fitness Components of Dilla University Sedentary Female Community. The result showed that there were significant improvement in cardiovascular endurance, muscular endurance, muscular strength and flexibility but in the case of body mass index and body weight there were reduction. But no published article or thesis in the study area focusing on the effect of aerobic exercises in the improvement of skill related physical fitness components. This gap triggers the researcher to conduct this research.

Beside this, In Guji Zone Uraga preparatory school teachers using aerobic activities for fitness improvement is at minimum level. Hence students are not beneficial by school aerobic exercises practices. Therefore, the primary intention of this study is to investigate the effect of aerobic exercises on skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State.

1.3 Objective of the study

1.3.1 General Objective

The General objective of the study is to investigating the effect of aerobic exercises on skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State.

1.3.2 Specific objectives of the study

1. To examine the effect of aerobic exercises on skill related fitness components.
2. To investigate the effects of different aerobic exercises on selected components of skill related fitness.
3. To assess the difference between the experimental group and the control group in different aerobic exercises for skill related fitness components.

1.4 Research questions

The following research questions were answered in study

1 What does the effect of aerobic exercises on performance related fitness components looks like?
2 Is there different effect of aerobic exercises on skill related fitness components?
3 How does students skill related fitness level differs between the experimental group and the control group in different aerobic exercises?

1.5 Significance of the study

Education is not only preparation for life it is life itself. This study is believed to provide partial solution in identifying the effect of aerobic exercises on performance related physical fitness and which type of aerobic exercises is better to improve each components of skill related physical fitness components. So, conducting a research in this area may have the following significance.

- Helps to find out the role of aerobic exercises to improve physical fitness components in physical education practical class.
- The study rule outs the importance of different aerobic exercises for the improvement of skill related physical fitness.
- To provide accurate factors that affect skill related physical fitness.
- Provides base line information about the relationships between skill related fitness components and aerobic exercises for physical education teachers.

1.6 Delimitation of the Study

The study has two delimitations: the conceptual and geographical delimitation. The effect of aerobic exercises on physical fitness components is broad issue; which is difficult to be dealt with in such time bounded study, so the study is delimited in effects of aerobic exercises on four selected skill related physical fitness components. And also here in Guji zone there are a lot of Preparatory Schools, since the study design is quasi experimental it is difficult to conduct in all schools because of this, the researcher delimited the scope of the study in Uraga preparatory school. The study is delimited in two sections of grade 11^{th} students.

1.7 Limitations of the Study

While conducting this study, the researcher encountered some limited factors that can affect the quality of the research work. This includes financial and time constraints, lack of local reference materials, and other resources, including related researches in our context.

1.8 Definition of Terms

Fitness: is a condition in which an individual has sufficient energy to avoid fatigue and enjoy life.

Physical fitness: is general state of health and well-being and more specially the ability to performance aspects of sport or occupations.

The state of general well-being, physically sound and healthy, along with mental stability.

Skill- or performance-related fitness involves skills that will enhance one's performance in athletic or sports events

Aerobic exercise is exercise that burns fat and increases the heart rate, and which requires a certain amount of endurance over a long period of time.

Power is considered to be a combination of strength and speed. It has also been defined as the ability to exert muscle force quickly. For this reason some consider it to be a combination of skill and health related physical fitness. Power includes putting the shot and vertical jumping. But, there are many different types of power and total assessment would require many different tests. http://www.fitness.Gov/publications/digests/digests.mar 2000.html

Agility is common as screening tests among sports teams. A shuttle or zigzag run is examples of exercises that develop agility. Critical periods of development for agility occur between the ages of 9 and 12 years old, with complexity and specificity beginning around the ages of 16 to 17 years. An athlete that displays good agility will most likely possess other qualities such as, dynamic balance, spatial awareness, rhythm, as well as visual processing. So while agility can be simply defined as an ability to quickly stop and re-start motion, there is a high degree of complexity to this motor skill (Jason, Vescovi and Bartik 2011).

1.9 Organization of the study

This research work is prearranged in five broad chapters. Chapter one deals with introduction, statement of the problems, research questions, objectives of the study, significance of the study, delimitation of the study, limitations of the study, definition of terms and organization of the study. Chapter two is about review of related

literature. Chapter three deals with research design (method) and methodology. Chapter four deals with analysis and interpretations of data collected. And finally the last chapter involves summary, conclusions and recommendations provided by the researcher.

CHAPTER TWO

2. REVIEW OF RELATED LITERATURES

This chapter is highly concerned with the presentation of a review of related literatures from different scholars on the effects of aerobic exercises on skill related physical fitness components. The chapter deals with Historical Development of Physical Education, The aim of physical education, Importance of Physical Education, The concept of physical fitness, Components of skill-Related Physical Fitness and the types of aerobic exercises

2.1 Historical Development of Physical Education

Physical education ranks to historically the oldest elements of education. It start with the beginnings of the development of man, when motion was a social phenomenon conditioned by material conditions, vital for the preparation of man for fight and motional fitness was an evolutional selective impulse (Jurkechova, Vlcek, & Bartik, 2011). Physical activity has been around for long time and the Greek culture took physical activity to another level by incorporating it into games known as the Olympics. Olympics were events where athletes show off their physical fitness in sporting activities by competing against one another. Since the Olympics started, physical fitness is considered to be the backbone of physical education in today's school systems (Lumpkin, 1986).

Since that time, civilizations and cultures throughout Europe have constantly contributed to the development of physical education. The European legacy of athletics, gymnastics, and sports laid the foundation for the physical education programs in the world. Because of the popularity of the gymnastics in Europe, people in other parts of the world began to become more concerned about their health. As provisions were made in public education to educate more and more

children, schools placed emphasis on reading, writing, and arithmetic, and showed little interest in physical education (Bishop, 2005).

With this transition taking place, physical education was endorsed in schools to inform the people about the importance of children being physically fit. Therefore, physical education programs became popular in school curricula, and with this popularity, children were eager to participate. With this new acceptance, many state educational systems now understood the importance of physical education and the need for the students to be physically fit and stay fit during their lives (Jurkechova et al, 2011).

When first started, physical education class was not considered to be a part of the regular curriculum; instead, it was considered as co-curricular class. Physical education class was separated from regular education classes, such as language arts, mathematics, and science, and viewed as a special area of education. Originally, educators thought physical education class had little/no relationship with other academic areas. Instead, activities during physical education class were to promote fun and provided a type of physical release that helped children to get their minds away from content area learning tasks (Garn & Cothran, 2006).

Physical education class today is recognized for its effectiveness in helping to provide the activities through physical activity that can yield preventive health benefits throughout a person's lifetime. With this effort now taking strides to boost children's physical activity, it was more likely that physical education curricula will develop accordingly. This is evident in the past few years with many states now mandating that children participate in physical education class. With this mandate in place, physical education program aimed for students to take part in regular physical activity, understand the health benefits from participation, and become physically fit (Meredith & Welk, 2009).

2.2 The concept of physical fitness

Concept of physical fitness is as old as humankind. Throughout the history of mankind physical fitness has been considered an essential element of everyday life. The ancient people were mainly dependent upon their individual strength, vigor and vitality for physical survival. This involved mastery of some basic skill like strength, speed, endurance, agility for running, jumping, climbing and other skills employed in hunting for their livings.

Over the past four decades, there has been an increase in the prevalence of overweight and physical fitness deterioration in adult across all genders, ages and racial/ethnic groups (Ichinohe et al. 2004).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, respiratory problems, and gout and is associated with increases in all-cause mortality (Cataldo, 1999). In adults, relationship among physical activity, health related fitness, and health are fairly well established. Low levels of physical activity and cardio-respiratory fitness are both associated with higher risk of all cause and disease specific mortality. Physical fitness is the ability to perform daily activities willingly and actively. Physical fitness includes not only components of sports but those of health as well (Thune et al. 1998).

Fitness is a general term to describe someone's body conditions physiologically, psychologically and sociologically. However, the meaning of fitness is various. Physical fitness can be referred to the total dynamic physiological state including aerobic endurance, strength, flexibility, speed, body composition, coordination, nutrition and diet, and rest and relaxation of an individual ranging on a continuum from optimal human performance to severe debilitation and death. In addition, these components of physical fitness also interact with other factors such as the genetic factor (Watson, 1995).

2.3 Components of Physical Fitness

According to NSCA, (2001) Physical fitness is most easily understood by examining its components, or parts. There are two major components of physical fitness. These are health related fitness components such as cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition and skill related fitness components such as agility, power, coordination, balance, reaction time, and speed. As the President's Council on Fitness, Sports and Nutrition (PCPFS) notes, there is a cause-effect relationship between physical activity and health. Plainly said, with increased levels of activity, we improve our levels of physical fitness and enjoy better health, afforded by the benefits of exercise.

2.3.1 Heath related fitness components

1. Cardio Respiratory Endurance:- The efficiency with which the body delivers oxygen and nutrients needed for muscular activity and transports waste products from the cells. The best way to improve cardio respiratory fitness is to participate regularly in a demanding aerobic exercise program. Muscular fitness has two components: Muscular strength and Muscular endurance. Although muscular endurance and strength are separate fitness components, they are closely related. Progressively working against resistance will produce gains in both of these components.

According to Shephard, (2001), young adult hood typically covers the period from 20-35 years of age, when both biological function and physical performance reach their peak. During young middle age (35-45) years, physical activity usually wanes, with a 5-10 kg accumulation of body fat. During latter middle age (45-65) years women reach the menopause, and man also substantially reduce their output of sex hormones. In early old age above 65 years, there may be a modest increase of physical activity, in an attempt to fill free time. Because initial fitness is quite low, the aerobic condition of a senior

can be improved by low intensity of training, gains are greatest if a heart rate of 130-140 beats per minute can be sustained, but useful if slower progress is seen with regular training at heart rates of 110-120 beat per minutes. In the frail elderly, heart rates rarely exceeds 85 beat per minute, and some training response may then be anticipated even with activities inducing a heart rate of only 100 beats per minute. There is only an increase in heart rate during exercise because the heart needs to pump more blood to the different muscles. This increase is directly proportional to the increase of intensity of exercise. Average heart rate is 60-70 beat per minute, and during exercise it increases to 165-190 beat per minute. Aerobic activity as being long in duration yet low in intensity, heart rate at rest decreases as a result of endurance training. Heart rate during sub maximal exercise also decreases, often by about 20-40 beat per minute following 6 months of moderate training. Using the same large muscle group, rhythmically, for a period of 15-20 minutes or longer while maintaining 60-80% of your maximum heart rate, maximum heart rate either remains unchanged or decreases slightly with training.

2. Muscular Strength:-The greatest amount of force a muscle or muscle group can exert in a single effort. The greater the muscular strength of an individual, the greater the amount of force he or she will be able to generate. If your goal is building strength, your workouts will consist of heavy loads that fatigue you to failure within a short number of repetitions. Depending on the amount of weight you use to perform the exercise, this might be anywhere from 3 to 12 repetitions.

According to WHO, (2005), women have smaller amounts of the anabolic hormone testosterone and therefore have less muscle mass and size than men. Because of this, women typically have 60% to 80% of the absolute strength of men and have relative strength similar to man. Muscle strength peaks, around 25 years of age, plateaus through 35 or 40 years of age, and then shows an accelerating

decline, with 25% loss of peak force by the age of 65 years. The male and female strength ratio is unchanged, so that women are limited by a loss of strength at an earlier age than men. Muscle strength can be greatly improved as little as 8 weeks of resistance training, even in 90 years old. Maximum strength is usually reached in the 20s and typically decline with age. As people grow older, regardless of gender, muscular strength is better among people who train than people who do not. This suggests that progressive resistance training is one antidote to premature aging

3. Muscular Endurance:-The ability of a muscle or muscle group to perform repeated movements with a sub-maximal force for extended periods of time.

Joseph et al.., (2005), stated that if you are tested on absolute endurance measured by the maximum number of repetition or muscle contractions, one can perform against a given resistance (e.g. the number of times you can move a designated number of pounds), a stronger person has an advantage. However, if you are tested on relative muscular endurance (the number of times you can move a designated percentage of your maximum strength), the stronger person does not have an advantage. For this reason men and women can compete more evenly in relative muscular endurance activities. In fact, on some endurance tasks women have done as well or better than men. If your goal is to build muscular endurance, you will decrease the amount of weight you use so that you can continue to perform repetitions over the course of a workout without failure, continuing exercise for 30 minutes or more. Muscular endurance showed great variability between individuals. However, no decrease in endurance was seen in older ages. Though muscular endurance declines with age, it is not as dramatic as decreases in absolute strength.

4. Flexibility:-The ability to move the joints for example, elbows knees or any group of joints through an entire, normal range of motion. Flexibility is highly specific and varies for each joint or joint group. Thus, the flexibility of certain joints cannot be used to generalize the flexibility of other areas of the body; there is also a relationship between flexibility measures and differences in sex and age.

A study Kras, H. (1972) done on several 100 adults who had complaints of chronic lower back problems revealed that approximately 80% had sever muscle weakness and joint inflexibility diagnosed as the cause, while only 20% had a specific anatomical disease or lesion as the cause. Thus, there is an obvious tendency in our society to neglect the body through lack of physical exertion including stretching and flexibility exercise. Although flexibility can be increased with persistent exercise, the magnitude of increase is a very individual matter and is dependent up on the specific types and forms of activity. There is little scientific evidence to indicate that a person who can reach 2 inches past his or her toes on a sit and reach test is less fit than a person who can reach 8 inches past the toes. As children grow older, their flexibility increases until adolescence when they become progressively less flexible, generally girls tend to be more flexible than boys is probably due to anatomical differences in joints and differences in type and extent of activities they choose. In adults, there is less difference between sexes and older adults frequently have reduced flexibility, principally because of reduced activity, regular stretching can help older people maintain good flexibility throughout life.

5. Body composition:-is often considered a component of fitness. It refers to the makeup of the body in terms of lean mass (muscle, bone, vital tissue and organs) and fat mass. In terms of health, fat is the main point of interest and everything else is termed lean body tissue. The amount of fat we carry varies from person to person and healthy

averages vary with gender and age. Being over fat or under fat can result in health concerns. A healthy amount of fat for a man is between 15 and 18% and for women is higher at 20-25%.An optimal ratio of fat to lean mass is an indication of fitness, and the right types of exercises will help you decrease body fat and increase or maintain muscle mass (Head Quarters Department of the US Army, 1998).

According to Vikram et al, (2003), a BMI of <18.9 as underweight and may indicate mal nutrition, an eating disorder or other health problems, while a BMI >25 is considered over weight and above 27 is considered obese or high risk. As exceptionally, people who do regular physical activity and possess a large muscle mass and size can be high in body weight without being too fat and weighting at the same time of day, preferably early in the morning is best, because it is more likely to represent real changes in body composition. There is loss of height through aging; BMI will increase without any corresponding increase weight.

2.3.2 Components of skill-Related Physical Fitness

As cited from **www.mhhe.com/hper/physed/clw/student/01corb.pdf** retrieved on September 21 2016, the skill-related components of physical fitness are more associated with performance than good health. The components of skill-related physical fitness are agility, balance, coordination, power, reaction time, and speed. They are called skill-related because people who possess them find it easy to achieve high levels of performance in motor skills, such as those required in sports and in specific types of jobs. Skill-related fitness is sometimes called sports fitness or motor fitness.

There is little doubt that there are other abilities that could be classified as skill-related fitness components. Also, each part of skill-related fitness is multidimensional. For example, coordination could be hand-eye coordination such as batting a ball, foot-eye coordination such as kicking a ball, or any of many other possibilities. The six parts of skill-related fitness identified here are those that are

commonly associated with successful sports and work performance. It should be noted that each could be measured in ways other than those presented in this book. Measurements are provided to help the reader understand the nature of total physical fitness and to help the reader make important decisions about lifetime physical activity (Ibid).

Fitness is a broad term that means different things to different people. Fitness denotes dynamic qualities that allow one to satisfy needs regarding mental and emotional stability, social consciousness, adaptability, spirituality and physical health (Shahana, 2010). American Alliance of Health, Physical Education, Recreation and Dance [AAHPERD] defines physical fitness as a physical state of well being that allows people to perform daily activities with vigor, reduce their rise of health problems and establish a fitness base for participation in variety of activities (Auxter, Pyfer & Huettig,1997).

Physical fitness is also defined as having the energy and strength to perform daily activities vigorously and alertly without getting "run down" and having energy left over to enjoy leisure – time activities and meet emergency demands (Shahana, 2010).

According to Shahana, (2010), when you are physically fit, your heart, lungs and muscles are strong and your body is form and flexible. Your weight and percentage body fat are within a desirable range. Also according to the definition given by Microsoft Encarta Encyclopaedia, (2004), physical fitness is the ability of the human body to meet demands imposes by the environment and daily life. Fitness is a state of the body that helps develop a more positive and dynamic attitude to life and is likely to affect most phases of human existence. Efficiently working lungs and heart, general alertness, muscular strength, energy and stamina is the overt sign of physical fitness. Shahana, (2010) also defines fitness to mean that the various systems of the body are healthy and function efficiently so as to enable the fit person to engage in activities of daily living as well as in recreational pursuits and leisure activities, without unreasonable fatigue.

Nowadays the idea of the four "S" words – stamina, strengths, suppleness and skill representing fitness has been replaced by the concept of fitness, which includes health –related and motor skill related components. AAHPERD has classified the components of physical fitness into two categories, health related components and motor skill related components (Shahana, 2010). Skill-related or performance-related physical fitness consist of those components of physical fitness that have relationship with endurance performance in sports and motor skills. The components are commonly defined as agility, balance, coordination, power, speed and reaction time.

According to Siedentop (2001), physical fitness is pursued by people in many different areas including schools, health spas, sports clubs, weight training centres, Young Men Christian Association or Young Women Christian Association facilities, recreation centres and even homes.

Components of motor skill-related physical fitness are called skill-related, because people who possess them find it easy to achieve high levels of performance in motor –skills, such as those required in sports and specific type of jobs (Carbin, Lindsay & Welk, 2000). There is little doubt, that there are other abilities that could be classified as skill-related or performance-related fitness components. The skill-related components are agility, balance, coordination, speed and reaction time. Many of this components work closely together. However specificity does exist and such skills cannot be categorized in general. A combination of this skills or ability usually determines a skilled performance in a particular sport. It is noted also that a high level of health-related components, may make skill acquisition easier. One cannot improve skill of one is fatigued and lacking strength or flexibility. Also each part of motor skill-related fitness is multi dimensional (Carbin et al 2000).

The ABCs (Agility, Balance, and coordination) of skill-related fitness are commonly referred to as the ability to change direction quickly and to move as efficiently as possible with minimal energy expenditure. These three components can be improved or developed by the use of developmental training programs, specific exercises or drills and sports participation. Some experts contend that strength is the most important factor of agility, since a stronger body moves with more ease and efficiency. Flexibility is the most important to balance and coordination by increasing one's range of motion. Agility-type drills should involve a number of direction changes, place the performer in a variety of body position and be of short duration so fatigue does not become a factor (Auxter et al, 1997). Most experts fell that the best method for improving upon a specific activity or sport is to practice the starting stimulus for that activity (Auxter, et al, 1997)

There is no substitute for sports skill training, practicing a skill for specific sports participation also develops skill-related physical fitness. Activities like handball, basketball, gymnastics, wrestling, volleyball, tennis and soccer are a few of many activities that could be used for motor sill development.

Possessing a moderate amount of each component of health –related fitness is essential to disease prevention and health promotion, but it is not essential to have exceptionally high levels of fitness to achieve health benefits (Carbin et al, 2000). High levels of health –related physical fitness relate more to performance than health benefits. For example, moderate amounts of strength are necessary to prevent back and posture problems, whereas high levels of strength contribute most to improved performance in activities such as football and jobs involving heavy lifting. The components of health related and motor skill related physical fitness overlap. For example, cardio-respiratory endurance, muscular strength, flexibility and body composition are essential for healthy living. They are also important in skilful motor performance. However, the degree of development each requires varies according to the type of physical activity. A more extensive

development of these components may be required to achieve an appropriate level of motor skill related physical fitness, which is often associated with sport. For example, athletes may need to develop speed and power to a greater degree than most individuals who are interested solely in improving and maintaining health related fitness (Prentice, 1999). Thus, participating in activities to improve physical fitness enhances a person's attitude about life, enhances his/her ability to perform activities of daily living, enhances sports and leisure skills and improves the maintains health . It is also worth noting that, what we doo with our bodies affects what we can do with our mind, thus physical fitness influences qualities like mental alertness and emotional stability. It is assumed that people who possess skill related fitness will be more likely to engage in regular activity, and for this reason will have enhanced health –related fitness and a lower risk of hypo kinetic diseases and condition.

Skill-related fitness components assessed with performance measures. Such components as reaction time and speed are considered by some to be more related to heredity than health lifestyles, especially in children. Physical activity provides performance benefits above and beyond the benefits to health. These performance benefits can promote quality of life for the normal human adult and enhance the abilities of athletes and people in jobs requiring high level of performance (Carbin, et al, 2000).

Possessing high levels of the six primary components of motor skill-related physical fitness (agility, balance, reaction time, accuracy and speed), make experts consider various perceptual abilities such as depth and distance perception (ability to judge depth and distances accurately), and visual tracking (ability to visually follow a moving object), to be skill –related parts of physical fitness (Carbin et al, 2000) as an individual might possess ability in one area and not area and not in another and for this reason, general motor ability probably does not really exist. Individuals do not have one general capacity for performing. Rather, the ability to play games or sports is determined

by combined abilities in each of the spate skill-related components. It is however, possible and even likely that some performers will be above average (Carbin et al, 2000).

Agility

This is defined as the ability to rapidly and accurately change the direction of movement of the entire body mass in space (Carbin, et al, 2000). Agility also means a quick and efficient upward and downward motion in ballet, modern dancing and some folk dancing. According to Prentice (1999), agility is to a large extent dependent on neuromuscular co-ordination and reaction time. In such sports like basketball, badminton, handball and tennis, the ability to sop and start, and to change direction, is nearly a prerequisite to success. Also, people who are agile are less accident prone, because of their ability to make quick adjustments in body movements. The motor ability of agility is difficult to develop. However, it can be improved through participation in activities which develop. However, it can be improved through participation in activities which develop strength, coordination, and speed. If strength is increased, agility will increase in movements involving the force of inertia, which keeps the body in motion in the same direction.

Developing speed and agility in sport is specific to the game or sport an athlete plays. In team or court-based sports, it differs from the technique of a 100m sprinter, in that the track athlete can run flat-out, with maximum stride length and stride rate in a straight line. For example, the speed and agility requirements in a court-based sport are very different to those of a field –based team sport. In badminton, because of the very small a court, an athlete will take a maximum of one or two steps in a particular direction to cover the court, involving a high frequency of diagonal, lateral , forward and backward movements . a netball, hockey, or rugby player, on the other hand, would rarely travel more than thirty metres, so the most important qualities are very different. Acceleration and the ability to change direction rapidly is the key in team sports.

To improve speed and agility, strength and conditioning coaches would include specific workouts targeting that physical quality into the weekly programme of an elite team sport athlete, in addition to the endurance or strength training they were practicing, to produce an enhancement in performance at elite level, the player or sports specific needs are carefully considered, before drills which develop the skills are designed, mostly concentrating on acceleration and change of direction (Dick, 1997).

In rugby or hockey, a player would accelerate into position, either to find space or to make a challenge, but those movements are often angled runs, changes of direction whilst running or running in a curve. So, any exercised or drills designed to improve that ability, would necessarily be sports-specific (Dick, 1997).

According to strength and conditioning coach, Raph Brandon, "improving speed and agility is more of a skill than physiological ability, such as strength. Most training sessions involve very specific, high-quality session, with plenty of rest, rather than lots of repetitions. It is difficult to define one set of agility exercise, although there are certain general exercises that are useful for developing footwork skills, agility ladders, side stepping, basic cross over forward and backwards ,and shuttle runs which can be useful for a number of sports" (Dick, 1997).

We can improve our agility by improving the component parts of agility and practicing the movement in training. One of the ways to improve agility is by the agility ladder .In various fields of sports competition, the body is by agility are by the agility ladder. In various fields of sports competition, the body is constantly asked to perform movements from unfamiliar joint angles. The main objective for agility ladder programme is to promote a wide range of different foot and movement patterns. These skilled movements, become second nature, and the body is able to quickly respond various angles that are required in sporting events. We can improve our agility by practicing the movements in training, and an agility ladder is an essential tool in

a complete programme. Using a standard ladder of 10yards long with 18 inch squares, 2 to 4 movement patterns are introduced. Once you master these patterns, introduce new patterns. Keep in mind that this is a general recommendation, as the introduction of movements depends on athlete's ability to master the movements.

Balance

The ability to establish and maintain one's balance has long been recognised as an important element of skilful movement behaviour (Clark & Watkins, 1984]). Indeed, balance has been identified as one of the many abilities underlying the motor skill performance of both young populations (Clark & Watkins, 1984]) and adult groups. Yet despite its recognised importance to motor skill performance and development, balance has received relatively little attention in psychometric research. The most comprehensive study on balance remains the early work of Bass (1939 as cited [in Clark &Watkins, 1984]), in which she identified through factor analysis eight balance factors. These factors were general eye motor factor, general kinaesthetic response factor, general ampullar sensitivity, vertical semi-circular canals function, tension giving reinforcement and three unnamed factors.

Furthermore, the complex quality called balance involves reflexes, vision, the inner ear, the cerebellum, and the skeletal-muscular system which forms a specific kind of coordination. Balance is defining to be the ability to maintain some degree of equilibrium while moving or standing still (Shahana, 2010). According to Auxter, et al, (1997) balance is the ability to maintain equilibrium in a held position (static) or in moving position (dynamic). The ability to maintain the equilibrium of a body manifests itself in two types, static balance, and dynamic balance. Static balance involves the maintenance of equilibrium in a fixed position such as while standing on one foot on a narrow stick for a period of time. Dynamic balance on the other hand is when the equilibrium must be maintained while moving. Walking on a balance beam is an example of dynamic balance.

According to Shaphared (1997), balance is a more global term, referring to the control processes that maintain body parts in the specific alignment necessary to achieve different kinds of mobility and stability. Most sensory system (vestibular, kinaesthetic, tactile, and visual), interact with environmental variables to bring about balance.

According to Auxter, (1997) until balance became an automatic, involuntary act, the central nervous system must focus on maintaining balance to the detriment of all other motor and cognitive function. Balance development is dependent on vestibular, visual reflex, and kinaesthetic development. When these systems are fully functioning, high level of balance development is possible. Success in certain activities depends directly upon the balance. Gymnastics events, such as floor exercise routines, and balance beam performance require good balance. Stability is especially important in contact sports such as wrestling, American football, Rugby, and soccer, but can also be found in lifetime activity like skiing, bowling, golf and tennis. The basic factors which influence balance are the height of the centre of gravity, the size of the basic support and the line of gravity.

But the principles which aid balance include:

- the lower base, the greater the balance and stability
- The larger the base of support, the greater the balance and stability
- The more nearly the cantered the line of gravity is to the centre of the base of support, the greater the stability.

  - Activities that can be used to promote dynamic balance include:

1. Hopscotch
2. Various types of locomotors movement following patterns on the floor
3. Races using different types of locomotors movement.

4. Walk forward heel to toe between double line, on single line, then on balance beam, make this more demanding by having child balance a bean bag on balance different body parts (e.g. head, shoulder, wrist, etc) while walking on the balance beam.

Cues to poor balance developments include:

1. Inability to maintain held balance position, e.g. standing on one foot, stand heel to toe with eyes open.
2. Inability to walk heel to toe on a line or on a balance beam.
3. Tipping or falling easily.
4. Wide gait while walking or running (Auxter et al 1997)

According to Shaphared (1997), input from both semicircular canals and the sacs are needed in all kinds of balance. This is because the head moves in many ways during both static and dynamic balance. The principle of specificity tells us that there are many kind of static and dynamic balance, balance and a test of balance in one position will not yield data that are generalized to other positions. The maintenance of balance, involves both sensory input and motor output. Many motor impulses are generated to control balance. Some go directly to muscles that activate reflexes and or reactions, some go to the cerebellum, and some go to midbrain nuclei of cranial nerves that innervate the eye muscles.

Balance in young children is heavily influenced by vision, whereas adults rely more on tactile and kinaesthetic input (Shaphared, (1997). This explains why children and persons with developmental delays are encouraged to focus their eyes on a designated point during balance activities. It also explains why blindfolds are often used in testing and remediation of balance.

The vestibular system is well developed at birth, as is evidenced by the calming effect of cradling or rocking the infant in the arms, crib, or rocking chair. Swings, seesaws, merry-go-rounds, and other playground apparatus owe their popularity to children's natural

craving for vestibular stimulation. The use of balance boards, various kinds of balance beams, swinging bridges and trampolines in early childhood physical education is based largely on the theory that postulates that the vestibular system is a coordinating mechanism for all sensory function that leads to balance (Shaphared, (1997).

Coordination—the ability to use the senses with the body parts to perform motor tasks smoothly and accurately. Juggling, hitting a golf ball, batting a baseball, or kicking a ball are examples of activities requiring good coordination.

Power—the ability to transfer energy into force at a fast rate. Throwing the discus and putting the shot are activities that require considerable power.

Speed—The ability to perform a movement in a short period of time. A runner on a track team or a wide receiver on a football team needs good foot and leg speed.

Reaction time—the time elapsed between stimulation and the beginning of reaction to that stimulation. Driving a racing car and starting a sprint race require good reaction time.

Cited from ***www.mhhe.com/hper/physed/clw/student/01corb.pdf*** retrieved on September 21 2016.

2.4 Aerobic exercises

As cited in http://www.healthguidance.org/pages/Terms-of-Service retrieved on September 21 2016, aerobic exercise is exercise that burns fat and increases the heart rate, and which requires a certain amount of endurance over a long period of time. More technically, cardiovascular exercise is anything which forces the body to use its 'aerobic' system to get energy. The aerobic system is the body's ability to get energy from using oxygen to burn fat cells and carry the resultant energy to the required areas of the body. Bellow then is some examples of cardiovascular exercises that could choose from, along with some of their strengths and weaknesses.

2.4.1 Running/Jogging Running is a great way to burn calories and one of the 'go to' methods of cardiovascular exercise. Don't need any equipment which is one of the benefits, and everyone know how to do it. At the same time participant can go running outside and use the opportunity to see some scenery which past as run through the neighborhood. Running will also improve the fast twitch muscle fibers in legs due to the explosive movements of running, and the slow twitch muscle fibers due to the endurance required. Jogging also triggers the release of many desirable hormones, such as endorphins which are happiness hormones that cause the 'runners' high' and make running even more addictive and satisfying, and such as growth hormone in high quantities which results in more muscle being built and more fat being burned. Finally running and jogging method of improving cardiovascular fitness are easy to implementing in secondary schools setting.

2.4.2 Rope Skipping is an underused and underrated form of exercise that actually is one of the very best ways to burn calories quickly in a confined space. All need to start skipping is a rope and enough floor space to swing it and this makes it one of the quickest and easiest ways to start cardiovascular fitness.

2.4.3 Aerobic scatter dancing is an absolutely great way to burn fat, and it doesn't have to be professional dancing arranging students in line and performing different exercise for cardiovascular endurance fitness.

2.4.4 Rowing

Rowing is a fantastic form of cardiovascular fitness that has low impact and works all of upper body (particularly lats). At the same time this again has no impact and means that will get to see a lot of nice scenery.

2.4.5 Other Sports Almost any sport with a few exceptions involves a lot of cardiovascular fitness and particularly running. Football, soccer, tennis, table tennis, basketball, volley ball and hand ball all of them will involve some element of running after balls and up and down a pitch or court. Taking up a sport is also fun and sociable and this means it doesn't have that sense of 'dread' before go, and will be less likely to avoid going.

CHAPTER THREE

3. RESEARCH METHODOLOGY

This chapter deals with the general research methodology. It presents the research design, research method, description of the study area, the populations, sampling techniques, instrumentations, and methods of collection and analysis.

3.1 Study Site

The research conducts at Guji Zone Uraga preparatory school. Guji Zone is one of the 24 Zones of Oromia Regional State which is found in the south east part of Ethiopia. In Guji Zone there are 15 preparatory schools, Out of these Uraga preparatory school is purposively selected as a source of pertinent, adequate and reliable information for the study. Moreover, the rationale behind selecting this preparatory school using purposive sampling technique is its large number of students and its location is near to the researcher's home and work place. In addition to this, no research have done on the effects of aerobic exercises on skill related physical fitness components in this school.

3.2 Research Design

The research design for this study was quasi experimental. Under different forms of quasi experimental design the researcher focuses on pretest-posttest non-equivalent control group design. In this study the researcher was assigned subjects randomly to treatments. Pre-test and post-test were administered on skill related physical fitness performance. So, in order to see the significance differences between pre-test and post-test and to achieve the intended objective; the researcher select quantitative methods since the goal of quantitative methods is to determine whether the predictive generalization of a theory hold true. Accordingly, the pretest-posttest non-equivalent control group design is the most useful design for this study

3.3 Research Method

Since the study design is pre-post test non-equivalent quasi experimental so, it was conducted by using quantitative research method. This method was selected because; it helps to the accurate and complete description of the comparison study methods. It helps to make detailed to analysis of existing phenomena with the intent of employing data to justify current condition. The other method was practical observation in the field to test student fitness like agility test, speed test, balance test, power test, coordination and reaction time test.

3.4 The Study Population

According to Kumar (1999) a study population is the entire group of students to which a researcher intends the results of a study to apply. Therefore, the populations of the study are all Uraga Preparatory students in Guji Zone. According to the data obtained from administration of this Preparatory school there are 143 students of grade 11 and 12, among them 63 are grade 11 students and the remaining 80 are grade 12 students. There are four sections and each of them contains 30-40 students whose age lays between16 and 18. Since the number of sections is four, it was impossible to include all of them in this experimental study. Because, it is too difficult to control and address by the researcher to give treatment or training and test of skill related fitness for all of those sections. So, the researcher selected samples of two sections of students random.

3.5 Sample size and sampling techniques

In Uraga Preparatory school there are four sections. The researcher selected the two sections randomly because the researcher uses the pretest-posttest non-equivalent control group design. So of the total four sections, two sections 11^{th}A and 11^{th} B were selected randomly. Section A (Natural Science) contains 30 students and section B (social science) contains 33 students. The samples were grouped in to two

main groups, thus are experimental and control groups. Section 11th "A" is an experimental group and Section 11th "B" is control group.

3.6 Data collection instrument

To get reliable information from the research participants, types of instrument to be used have paramount importance. Thus, pre and post four selected skill related fitness tests namely Illinois Agility Run Test for Agility, One leg stand for Balance, Standing long jump for Power and Flying 30 meter Test for speed were identified as pertain tools of the study.

3.6.1 Illinois Agility Run Test

Objective

The objective of the Illinois Agility Run Test is to monitor the development of the Student's agility.

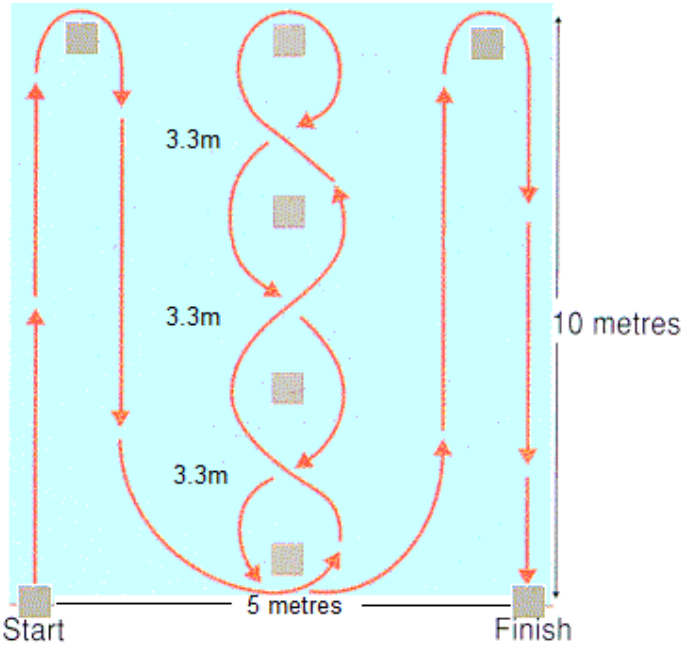
Required Resources

To undertake this test you will require:

- Flat non-slip surface
- 8 cones
- Stopwatch
- Assistant

How to conduct the test

This test requires the students to run the red line route in the diagram below as fast as possible.



- The student warms up for 7-10 minutes
- The assistance sets up the course as detailed in the diagram
- The student lies face down on the floor at the “Start” cone
- The assistant gives the command “GO” and starts the stopwatch.
- The student jumps to his/her feet and negotiates the course around the cones following the red line route shown in the diagram to the finish
- The assistant stops the stopwatch and records the time when the athlete passes the “Finish” cone

Assessment

The following normative data is available for this test.

For 16 to 19 year olds (Davis et al. 2000):

Table 3.1 normative data for Illinois agility run test

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	<15.2 secs	15.2 - 16.1 secs	16.2 - 18.1 secs	18.2 - 19.3 secs	>19.3 secs
Female	<17.0 secs	17.0 - 17.9 secs	18.0 - 21.7 secs	21.8 - 23.0 secs	>23.0 secs

3.6.2 Flying 30 meter Test

Objective

To monitor the development of the student's maximum sprint speed.

Required Resources

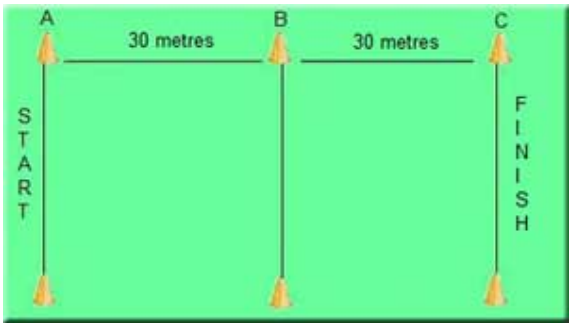
To undertake this test you will require:

- Flat non-slip surface
- Cones
- Stopwatch
- Assistant

How to conduct the test

This test requires the student to sprint 60 meters.

- The student conducts a warm up for 7-10 minutes
- The assistant marks out a 60 meter straight section (AC) with cones and places a cone at the 30 meter point (B)
- From a sprint start with appropriate start commands (on your marks, set, "GO") from the assistant the student sprints the 60m
- The assistant starts the stopwatch on the command "GO"
- The assistant records the time the student crosses the 30 meter point (B) and the 60 meter point (C)



Assessment

The following table, adapted from Davis (2000), is national norms for 16 to 19 year olds.

Table 3.2 Normative data for flying 30 meter run test

Gender	Excellent	Above Average	Average	Below Average	Poor
Male	<4	4.0 - 4.2	4.3 - 4.4	4.5 - 4.6	>4.6
Female	<4.5	4.5 - 4.6	4.7 - 4.8	4.9 - 5.0	>5.0

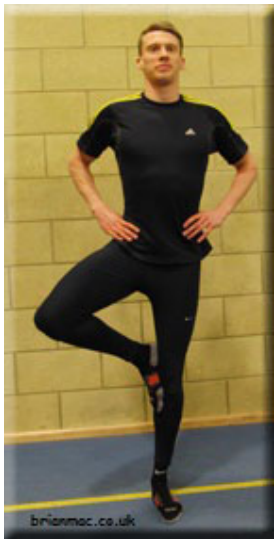
3.6.3 One leg stand Test

Purpose: To monitor the development of the student's ability to maintain a state of equilibrium (balance) in a static position.

Equipment required: Warm dry location, Stopwatch and Assistant

procedure

- The student warms up for 7-10 minutes
- The student stands comfortably on both feet with their hands on their hips
- The student lifts the right leg and places the sole of the right foot against the side of the left kneecap
- The assistant gives the command “GO”, starts the stopwatch and the student raises the heel of the left foot to stand on their toes
- The student is to hold this position for as long as possible
- The assistant stops the stopwatch when the student’s left heel touches the ground or the right foot moves away from the left knee
- The assistance records the time
- The student rests for 3 minutes
- The student stands comfortably on both feet with their hands on their hips
- The student lifts the left leg and places the sole of the left foot against the side of the right kneecap
- The assistant gives the command “GO”, starts the stopwatch and the student raises the heel of the right foot to stand on their toes



- The student is to hold this position for as long as possible
- The assistant stops the stopwatch when the student's right heel touches the ground or the left foot moves away from the right kneecap
- The assistance records the time

Assessment

The following normative data is available for this test.

The following table (Schell & Leelarthaepin 1994) is norms for male and females.

Table 3.3 Normative data for one leg stand test

Age		Excellent	Above Average	Average	Below Average	Poor
16-19 yr	Males	>50	37-50	15-36	5-14	<5
	Females	>27	23-27	8-22	3-7	<3

3.6.4 Standing Long Jump Test

The Standing long jump, also called the Broad Jump, is a common and easy to administer test of explosive leg power. The standing long jump was also once an event at the Olympic Games.

Objective

To measure the explosive power of the legs



Required Resources

- To undertake this test you will require:

Long Jump pit
30 metre tape measure
Assistant

How to conduct the test

The student warms up for 10 minutes
The student places their feet over the edge of the sandpit, crouches down and using the arms and legs jumps horizontally as far as possible landing with both feet into the sandpit
The assistant measures and records the distance from the edge of the sandpit to the nearest impression made by the student in the sand pit
The student repeats the test 3 times
The assistant uses the longest recorded distance to assess the students' leg power
Scoring: The measurement is taken from take-off line to the nearest point of contact on the landing (back of the heels). Record the longest distance jumped, the best of three attempts.
The table below gives a rating scale for the standing long jump test for adults, based on personal experiences.

Assessment

The following normative data is available for this test

The following table is normative value for Male students (adapted from: Hede et al. 2011)

Table 3.4 Males normative value for standing long jump

Age	Excellent	Above average	Average	Below average	Poor
14	> 2.11m	2.11 - 1.96m	1.95 - 1.85m	1.84 - 1.68m	<1.68m
15	>2.26m	1.26 - 2.11m	2.10 - 1.98m	1.97 - 1.85m	<1.85m
16	>2.36m	2.36 - 2.21m	2.20 - 2.11m	2.10 - 1.98m	<1.98m
>16	>2.44m	2.44 - 2.29m	2.28 - 2.16m	2.15 - 1.98m	<1.98m

The following table is normative value for female students (adapted from: Hede et al. 2011)

Table 3.5 Females normative value for standing long jump

Age	Excellent	Above average	Average	Below average	Poor
14	>1.91m	1.91 - 1.73m	1.72 - 1.60m	1.59 - 1.47m	<1.47m
15	>1.85m	1.84 - 1.73m	1.72 - 1.60m	1.59 - 1.50m	<1.50m
16	>1.83m	1.83 - 1.68m	1.67 - 1.58m	1.57 - 1.45m	<1.45m
>16	>1.91m	1.91 - 1.78m	1.77 - 1.63m	1.62 - 1.50m	<1.50m

3.7 Source of data

The researcher used both primary and secondary source to gather relevant and tangible information that were related with the study. The primary data were collected through pre test and post test, from selected experimental variable and fitness parameters and secondary source data source, journals ,books, guides and electronics materials like internet access or website documents.

3.8 Variables of the study

3.8.1 Independent Variables

Those are factors that determine the students' fitness outcome which includes:-

- Aerobic exercises
- Sex
- Age

3.8.2 Dependant Variables

This includes:-the four selected fitness components

- Agility
- Balance
- Speed
- Power

3.9 Pilot Study

3.9.1 Validity

Before conducting a pilot study, the researcher validate the instruments that were developed as follows; before the actual data collection started; the fitness parameters were given to colleagues so as to get valuable comments and criticisms on the strengths and weakness of the tests. Based on the comments obtained, necessary modifications such as changing the types and intensity of the exercises were made and given to the thesis advisor for further comments, criticisms and evaluation. The fitness test types and face validity were checked as the above stated by which they approved as they answer and cover the research questions and research objectives.

3.9.2 Reliability

The pilot study was conducted by pre- testing at the instruments at Uraga high school students that have the same characteristics as those in the main study. The participants in the pilot study were selected from the nearby high school (Uraga high school) those were volunteered to participate. The samples for the pilot study were taken

50% of the main study sample size, therefore the sample size for piloting was 30 students those were selected randomly from Uraga high school students. The purpose of this test was to check the appropriateness of the fitness tests and to make the necessary corrections based on the feedback obtained.

After collecting the fitness test scores, the results were entered to SPSS soft ware version 21.0. Then internal consistencies (reliability) of the tests were computed as follows.

Table 3.6 Reliability test result

No	Fitness tests	Tested variables	Cronbach-Alpha value	N	Remark
1	Illinois Agility Run	Agility	0.98	30	Excellent
2	One leg stand	Balance	0.87	30	Good
3	Standing long Jump	Power	0.76	30	Acceptable
4	Flying 30 meter	speed	0.74	30	Acceptable

As suggested by George and Mallery (2003) the Cronbach's Alpha result >0.9 excellent, >0.8 good, >0.7 acceptable, ∝< 0.6 questionable, and < 0.5 poor.

Thus, the instruments were found reliable to collect data for the main study and then administered as scheduled.

3.10 Methods of data collection procedures

The sampled students are grouped in two groups. Thus are the experimental and control groups. Before starting the training the researcher take pretest on selected fitness parameters tests. Both experimental and control got aerobic exercises training for 12 weeks. But the control groups take the training in a traditional method. Whereas, the experimental groups take the training based on the prepared schedule three times per week for 12 weeks.

3.11 Data Analysis

Data for this study were analyzed by using SPSS version 20.0. Data obtained from physical fitness tests were broken down and compared between groups. Descriptive statistics, frequency, mean, standard deviation, Independent t-test and paired t-test was used to analyze the data from physical fitness scores between groups. The analyzed data was reflected by using tables.

3.12 Ethical issue

Research ethics refers to the type of agreement that the researcher enters into with his or her research participants. Ethical considerations play a role in all research studies and all researchers must be aware of and attend to the ethical considerations related to their studies. Therefore the researcher communicates secondary schools legally and smoothly. The purpose of the study was made clear and understandable for all participants. Any communication with the concerned bodies accomplished at their voluntarily agreement without harming and threatening the personal and institutional wellbeing. Participant's economic background, ethnicity or race as means of identify were not considered because all these have nothing to do with the idea of the research disregards these issues. But during testing physical fitness the student's health status and physical disability care were taken. The identities of the respondents keep confidential.

CHAPTER FOUR

4. DATA ANALYSES, INTERPRETATION AND DISCUSSION

The purpose of the study was to investigating the effect of aerobic exercises on skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State. This chapter deals with the analyses of data collected from the subject under study. Furthermore, the study also find out the effect of aerobic exercises on selected skill related fitness components which were Agility, Balance, Power and Speed. To achieve the purpose of the study the researcher answered the following three research questions.

1. What does the effect of aerobic exercises on performance related fitness components look like?
2. Is there different effect of aerobic exercises on skill related fitness components?
3. How does students skill related fitness level differs between the experimental group and the control group in different aerobic exercises?

For this study 63 participants were purposely selected from Uraga preparatory school grade 11^{th} students. The physical fitness parameters selected for this study were Illinois Agility running, one leg standing, flying 30 meter run, and standing long jump test. The pre and post test were conducted for all sixty three participants and the score were recorded.

The data were analyzed using independent sample t-test, paired t-test and descriptive statistics. The results for each fitness variables were discussed in each table below. It also presents a summary of finding and discussion of the results.

4.1 Background of the study subjects

Table 4.1 Background of the study subjects (N=63)

Variables	**Responses**	**Experimental Groups**		**Control Groups**	
		F	**%**	**F**	**%**
Sex	Male	26	86.7	18	54.5
	Female	4	13.3	15	45.5
	Total	30	100.0	33	100.0
Age	16-18	28	93.3	26	78.8
	Above 18	2	6.7	7	21.2
	Total	30	100.0	33	100.0

As it can be indicated on table 4.1, the total respondents (63) grouped in to two groups. Thus are experimental and control groups. From 30 students of experimental group, 26(86.7%) were male and 4(13.3%) were females. According to their age, 28 (93.3%) were in the age category of 16-18 years. While the remaining 2 (6.7%) are in the age category of above 18 years.

From 33 students of control groups, 18(54.5%) were male and 15(45.6%) were females. According to their age 26 (78.8%) were in the age category of 16-18 years. The remaining 7 (21.2%) were in the age category of 16-18 years.

4.2 Analysis of Physical Fitness (performance) Parameter tests

The purpose of the study was to investigating the effect of aerobic exercises on selected skill related fitness components which were Agility, Balance, Power and Speed. For this 30 students were taken as experimental group and 33 students were taken as control group. The parameters selected for this study was Illinois Agility run test, one leg standing test , flying 30 meter test and standing long jump test. The pre and posttests were conducted for all sixty three participants and the scores were recorded.

4.2.1 Purpose of the test

The following Analyses result answers the first research question,

4 What is the effect of aerobic exercises on performance related fitness components?

The data were analyzed using the mean, standard deviation, independent sample t-test. Independent t-test was used to compare and check the significant differences between the two groups (experimental and control). So that in the following table the two groups were compared by using the students pre test and post test results. The collected data were analyzed by Independent sample t-test through SPSS version 20.0. The results for each fitness variables are discussed in the table below. It also presents a summary of finding and discussion of the results.

Table 4.2 Independent t- test Result of selected fitness parameters in both groups (N= 63)

Performance category	Group	Test	N	M	SD	t	df	p	MD
Illinois Agility Run	Experimental	Pre	30	21.263	2.93	1.262	61	.212	.9815
	Control	Pre	33	20.282	3.23				
	Experimental	Post	30	12.000	2.61	-9.439	61	.000	-8.00
	Control	Post	33	20.000	3.92				
One leg stand	Experimental	Pre	30	7.83	2.52	.400	61	.691	.258
	Control	Pre	33	7.58	2.59				
	Experimental	Post	30	17.50	8.58	6.391	61	.000	10.02
	Control	Post	33	7.48	2.61				
Standing long Jump	Experimental	Pre	30	1.1983	.18	-.391	61	.697	-.017
	Control	Pre	33	1.2158	.17				
	Experimental	Post	30	1.4823	.19	5.862	61	.000	.270
	Control	Post	33	1.2121	.18				
Flying 30 meter	Experimental	Pre	30	10.631	1.46	-1.096	61	.278	-.376
	Control	Pre	33	11.007	1.26				
	Experimental	Post	30	7.8533	1.44	-9.66	61	.000	-3.21
	Control	Post	33	11.065	1.19				

The above table shows that the output of independent t-test of the two groups (experimental and control groups) in accordance to Illinois agility run test, one leg stand test, standing long jump test and flying 30 meter run pretest and posttest results. The mean of pre test result of Illinois agility test for agility shows that 21.263 second and 20.282 sec in experimental and control group respectively. The mean difference of pre Illinois agility run test between experimental and control group is 0.9815 second at t-value 1.262 with degree of freedom 61. This is not significance because the p-value is greater than 0.05 which is 0.212. Whereas the mean of post test result is 12 sec and 20 sec in experimental and control groups respectively. The mean difference post Illinois agility run test between experimental and control group between the two is -8 sec at t-value -9.439, degrees of freedom (df) 61 and p-value 0.000. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t is statistically significant so,

based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of agility. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups. This insignificance value is due to the lack of treatment (aerobic exercises) during pre test.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of agility because the mean difference is significant at post test results but not significance in pre test results.

On the same table, variable two states the result of one leg stand pre and post tests. The mean of pretest result is 7.83sec and 7.85sec in experimental and control groups respectively. The mean difference is 0.258 at t-value .400, degrees of freedom (df) 61 and p-value 0.691. This implies that the mean difference of pretest result is not significance because the t-value (0.4) is less than table value (2.00 for N=63) and also the p-value is greater than 0.05. The mean of post test result is 17.50 sec and 7.48 sec in experimental and control groups respectively. The mean difference between the two groups is 10.015 sec at t-value 6.391 which is above the table value (2.00 for N=63), degrees of freedom (df) 61 and P-value 0.00 which is less than 0.05. This implies that the mean difference between the two groups of post test result of one leg stand test is significance. Generally, there is a significance mean difference between the experimental groups and control groups in post test results. This t is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of balance. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of balance because the mean difference is significant at post test results but not significance in pre test results.

When we see variable 3, the mean of pretest standing long jump result is 1.1983 meter and 1.2158 meter in experimental and control groups respectively. The mean difference is -.01742 at t-value -0.391, df 61 and p-value 0. 697. The mean of post test standing long jump is 1.4823 meter and 1.2121 meter in experimental and control groups respectively. The mean difference is 0.27021 at t-value 5.862, df 61 and p-value 0.00. The negative value of mean difference and t-value indicates that the mean of experimental groups is less than that of control groups in post test results. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of power. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of power because the mean difference is significant at post test results but not significance in pre test results.

On the same table variable 4 compares the mean of flying 30 meter test based on the pretest and post test results of the two groups. The mean of pretest is 10.6317 second and 11.0076 second in experimental and control groups respectively. The mean difference is -.37591 at t-value -1.096, df 61 and p-value 0.278 which is insignificant because t-value is below 2.00(table value for N=63) and

p-value is greater than 0.05. The mean of post test is 7.8533 second and 11.0652 second in experimental and control groups respectively. The mean difference is -3.21182 at t-value -9.660, df 61 and p-value 0.00 which is significance. The negative value of mean difference and t-value indicates that the mean of experimental groups is less than that of control groups in both pre and post test results. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of speed. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of speed because the mean difference is significant at post test results but not significance in pre test results.

4.3 Paired sample t-test

The purpose of this test was to check the significance difference between the pre and post test results of Illinois agility running, one leg stand test, standing long jump test and flying 30 meter run test in each groups.

The following Analyses result answers the second research question,

5 Is there different effect of aerobic exercises on skill related fitness components?

The data were analyzed using the mean, standard deviation, Paired sample t-test. Paired t-test was used to test for significant differences were chosen because there were two tests (pre and post tests) for one group for comparison. The collected data were analyzed by paired sample t-test through SPSS version 20.0. The results for each skill related fitness variables were discussed in the table below. It also presents a summary of finding and discussion of the results.

Table 4.3 Paired t-test of pre and post test results in experimental groups (N=30)

Paired group		**N**	**M**	**SD**	**M diff**	**t-value**	**df**	**P-value**
Pair 1	Agility Pre test	30	21.2633	2.92745	9.26333	12.866	29	.000
	Agility Post test	30	12.0000	2.60570				
Pair 2	Balance pre test	30	7.83	2.520	-9.667	-6.557	29	.000
	Balance Post test	30	17.50	8.581				
Pair 3	Power Pre test	30	1.1983	.18128	-0.2840	-6.657	29	.000
	Power Post test	30	1.4823	.18812				
Pair 4	Speed Pre test	30	10.6317	1.46078	2.77833	7.025	29	.000
	Speed post test	30	7.8533	1.44359				

The above table illustrates the results of pre and post tests that were provided for the experimental group of sample students. The Paired t-test shows the mean difference of pre-post results. The mean of agility pre test was 21.2633 and the mean of agility post test was 12 second. The mean difference between the pre and post agility test was 9.26333 at t-value 12.866, degrees of freedoms (df) 29 and p-value 0.000. Here

we understood that the mean difference of post and pre paired agility test were statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post agility test results.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of agility.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of agility because the mean difference is significant at p-value< 0.05.

The mean of balance pre test was 7.83 and the mean of balance post test was 17.50 second. The mean difference between the pre and post balance test was -9.667 at t-value -6.557, degrees of freedoms (df) 29 and p-value 0.000. Here we understood that the mean difference of post and pre paired balance test were statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post balance test results.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of balance.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of balance because the mean difference is significant at p-value< 0.05.

The mean of power pre test was 1.1983 meter and the mean of power post test was 1.4823 meter. The mean difference between the pre and

post power test was -0.2840 at t-value -6.657, degrees of freedoms (df) 29 and p-value 0.000. Here we understood that the mean difference of post and pre paired power test were statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post power test results.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of power.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of power because the mean difference is significant at p-value< 0.05.

The mean of speed pre test was 10.6317 and the mean of speed post test was 7.8533 second. The mean difference between the pre and post speed test was 2.77833 at t-value 7.025, degrees of freedoms (df) 29 and p-value 0.000. Here we understood that the mean difference of post and pre paired speed test were statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post speed test results.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of speed.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of speed because the mean difference is significant at p-value< 0.05.

Table 4.4 Paired t-test of pre and post test results in control groups (N=33)

Paired group		**N**	**M**	**SD**	**M diff**	**t-value**	**df**	**P-value**
Pair 1	Agility Pre test	33	20.2818	3.21942	0.28182	.860	32	.396
	Agility Post test	33	20.0000	3.91958				
Pair 2	Balance pre test	33	7.58	2.586	0.091	.144	32	.887
	Balance Post test	33	7.48	2.612				
Pair 3	Power Pre test	33	1.2158	.17228	0.00364	.083	32	.934
	Power Post test	33	1.2121	.17772				
Pair 4	Speed Pre test	33	11.0076	1.26195	-0.0576	-.362	32	.720
	Speed post test	33	11.0652	1.19285				

The above table shows the results of pre and post tests that were provided for the control group of sample students. The Paired t-test shows the mean difference of pre-post results. The mean of agility pre test was 20.2818 and the mean of agility post test was 20 second. The mean difference between the pre and post agility test was 0.28182 at t-value .860, degrees of freedoms (df) 32 and p-value .396. Here we understood that the mean difference of post and pre paired agility test were not statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was no significant difference between pre and post agility test results.

This implies that there was no a significance mean difference between the pre test and post test results in control groups. This t is not statistically significant so, based on the pre-post test means of control groups, we can say that the insignificant value is due to lack of treatment (aerobic exercises).

On the same table, Pair 2 (pre-post test of balance) states the result of balance pre and post tests. The mean of pretest result is 7.58 sec and

the post test mean is 7.48 sec. The mean difference between the pre and post test is 0.091 at t-value .144, degrees of freedom (df) 32 and p-value .887. This implies that the mean difference of pre-post test result is not significance because the t-value (.144) is less than table value (2.00 for N=33) and also the p-value is greater than 0.05. This insignificant difference is due to lack of treatment (aerobic exercises).

Pair 3 (pre-post test of power) states the result of power pre and post tests. The mean of power pre test was 1.2158 meter and the mean of power post test was 1.2121 meter. The mean difference between the pre and post power test was 0.00364 at t-value .083, degrees of freedoms (df) 32 and p-value .934. Here we understood that the mean difference of post and pre paired power test were not statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was no significant difference between pre and post power test results.

This implies that there was no a significance mean difference between the pre test and post test results in control groups. This t is not statistically significant so, based on the pre-post test means of control groups, we can say that the insignificant value is due to lack of treatment (aerobic exercises).

Pair 4 (pre-post test of speed) states the result of speed pre and post tests. The mean of speed pre test was 11.0076 second and the mean of speed post test was 11.0652 second. The mean difference between the pre and post speed test was -0.0576 at t-value -.362, degrees of freedoms (df) 32 and p-value .720. Here we understood that the mean difference of post and pre paired speed test were not statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was no significant difference between pre and post speed test results.

This implies that there was no a significance mean difference between the pre test and post test results in control groups. This t is not

statistically significant so, based on the pre-post test means of control groups, we can say that the insignificant value is due to lack of treatment (aerobic exercises).

4.4 Analysis of fitness tests post-pre deviation results

The purpose of the study was to investigating the effect of aerobic exercises on selected skill related fitness components which were Agility, Balance, Power and Speed. For this 30 students were taken as experimental group and 33 students were taken as control group. The parameters selected for this study was Illinois Agility run test, one leg standing test , flying 30 meter test and standing long jump test. The pre and posttest were conducted for all sixty three participants and the score were recorded.

4.4.1 Purpose of the test

The following Analyses result answers the third research question,

6 How does students skill related fitness level differs between the experimental group and the control group in different aerobic exercises?

The data were analyzed using the mean, standard deviation, independent sample t-test. Independent t-test was used to compare and check the significant differences between the two groups (experimental and control). So that in the following table the two groups were compare by using the students pre test and post test results. The collected data were analyzed by Independent sample t-test through SPSS version 20.0. The results for each fitness variables are discussed in the table below. It also presents a summary of finding and discussion of the results.

Table 4.5 Independent t- test Result of post-pre deviation results in both groups (N= 63)

	Group	**N**	**Mean**	**Std. Deviation**	**MD**	**t**	**df**	**p**
Agility post-pre deviation	Experimental	30	9.2633	3.94352	7.83000	10.850	61	.000
	Control	33	1.4333	1.22746				
Balance post-pre deviation	Experimental	30	9.67	8.074	6.788	4.653	61	.000
	Control	33	2.88	2.162				
Power post-pre deviation	Experimental	30	.2947	.21957	.09770	2.071	61	.043
	Control	33	.1970	.15148				
Speed post-pre deviation	Experimental	30	2.8317	2.09369	2.16197	5.695	61	.000
	Control	33	.6697	.58723				

MD= mean difference, df= degree of freedoms, p= probability value, t= table value

The above table shows that the output of independent t-test of the two groups (experimental and control groups) in accordance to the post-pre deviation of Illinois agility run test, one leg stand test, standing long jump test and flying 30 meter run results.

The mean of experimental groups in agility post-pre deviation result shows that 9.2633 second and the mean of control groups in agility post-pre deviation result was 1.4333 second. The mean difference between the experimental and control group was 7.83 second at t-value 10.850 with degree of freedom 61 and p-value 0.000. This is significance because the p-value is less than 0.05 and the t-value is greater than 2 (table value for N = 63). This implies that there is a significance mean difference between the experimental groups and control groups in Agility post-pre deviation results. This t is statistically significant so, based on the deviation mean difference of experimental and control groups, we can say that in experimental

groups aerobic exercises have a great effect on the improvement of agility. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of agility because the deviation mean difference between the two groups is significant.

On the same table, variable two states the result of one leg stand test (Balance) post-pre deviation results. The mean of the deviation of post-pre balance test in experimental groups is 9.67 second and the mean of the control groups is 2.88 second. The mean difference between the experimental and control group is 6.788 at t-value 4.653, degrees of freedom (df) 61 and p-value 0.000. This implies that the mean difference of the post-pre deviation of the two groups is significance because the t-value (4.653) is greater than table value (2.00 for N=63) and also the p-value is less than 0.05. This implies that the mean difference between the two groups is significance. Generally, there is a significance mean difference between the experimental groups and control groups. This t is statistically significant so, based on the post-pre deviation means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of balance.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of balance because the mean difference is significant at p-value <= 0.05.

When we see variable 3, the mean of post-pretest deviation of standing long jump (power) result in experimental group is .2947 meter and the mean of post-pretest deviation of standing long jump (power) result in control group is .1970 meter. The post-pre deviation means difference between the experimental and control group is .09770 at t-value 2.071, df 61 and p-value .043. This implies that there is a significance mean difference between the experimental groups and control groups in post-pre deviation mean differences. This t is statistically significant

so, based on the post-pre deviation means difference of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of power.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of power because the mean difference between the two groups is significant at p-value <= 0.05.

On the same table variable 4 compares the mean of flying 30 meter test for speed based on the posttest and pre test results of the two groups. The mean of experimental groups in speed post-pre deviation result shows that 2.8317 second and the mean of control groups in speed post-pre deviation result is .6697 second. The mean difference between the experimental and control group is 2.16197 second at t-value 5.695 with degree of freedom 61 and p-value 0.000. This is significance because the p-value is less than 0.05 and the t-value is greater than 2 (table value for N = 63). This implies that there is a significance mean difference between the experimental groups and control groups in speed post-pre deviation results. This t is statistically significant so, based on the deviation mean difference of experimental and control groups, we can say that aerobic exercises have a great effect on the improvement of speed.

Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of speed because the deviation mean difference between the two groups is significant.

CHAPTER FIVE

Summary, Conclusion and Recommendation

The purpose of the study was to investigating the effect of aerobic exercises on selected skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State.

This chapter deals with summery, conclusion and recommendations. In this section first a summary of the study and major findings are made. Second, conclusions of the fundamental findings are drawn. Finally, some possible recommendations forwarded based on the findings of the study.

5.1 Summary

The purpose of the study was to assess the effect of aerobic exercises on selected skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State. The sample size was 63 grade 11 students at Uraga preparatory school. Thus were divided in to experimental and control groups. For the purpose of data analysis, Independent t-test, paired t-test and descriptive statistics were used. To address the research objectives the following research questions were raised, the possible findings are summarized as follows.

1. What is the effect of aerobic exercises on performance related fitness components?

To answer this research question, the experimental and control groups, pre test and post test results of selected skill related fitness components were analyzed using independent t-test and the findings are presented as follows.

The mean difference of pre Illinois agility run test between experimental and control group is 0.9815 second at t-value 1.262 with degree of freedom 61. This is not significance because the p-value is

greater than 0.05 which is 0.212. The mean difference post Illinois agility run test between experimental and control group is -8 sec at t-value -9.439, degrees of freedom (df) 61 and p-value 0.000. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of agility. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups. This insignificance value is due to the lack of treatment (aerobic exercises) during pre test. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of agility because the mean difference is significant at post test results but not significance in pre test results.

The mean difference of one leg stand pre test result between the two groups is 0.258 at t-value .400, degrees of freedom (df) 61 and p-value 0.691. This implies that the mean difference of pretest result is not significance because the t-value (0.4) is less than table value (2.00 for N=63) and also the p-value is greater than 0.05. The mean difference of one leg stand post test result between the two groups is 10.015 sec at t-value 6.391 which is above the table value (2.00 for N=63), degrees of freedom (df) 61 and P-value 0.00 which is less than 0.05. This implies that the mean difference between the two groups of post test result of one leg stand test is significance. This t-value is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of balance. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups this is due to lack of

treatment. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of balance because the mean difference is significant at post test results but not significance in pre test results.

The mean difference of pretest standing long jump result is -.01742 at t-value -0.391, df 61 and p-value 0. 697. The mean difference prost test standing long jump result is 0.27021 at t-value 5.862, df 61 and p-value 0.00. The negative value of mean difference and t-value indicates that the mean of experimental groups is less than that of control groups in post test results. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t-value is statistically significant so, based on the post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of power. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups which was before getting aerobic exercise training. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of power because the mean difference is significant at post test results but not significance in pre test results.

The mean difference of flying 30 meter pre test results is -.37591 at t-value -1.096, df 61 and p-value 0.278 which is insignificant because t-value is below 2.00(table value for N=63) and p-value is greater than 0.05. The mean difference of flying 30 meter post test is -3.21182 at t-value -9.660, df 61 and p-value 0.00 which is significance. The negative value of mean difference and t-value indicates that the mean of experimental groups is less than that of control groups in both pre and post test results. This implies that there is a significance mean difference between the experimental groups and control groups in post test results. This t-value is statistically significant so, based on the

post test means of experimental and control groups, we can say that in experimental groups aerobic exercises have a great effect on the improvement of speed. Whereas, the pre test mean of experimental and control groups were almost the same. The independent t-test shows that no significance difference between the groups during pre test results. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of speed because the mean difference is significant at post test results but not significance in pre test results.

2. Is there different effect of aerobic exercises on skill related fitness components?

The mean difference between the pre and post agility test is 9.26333 at t-value 12.866, degrees of freedoms (df) 29 and p-value 0.000. Here we understood that the mean difference of post and pre paired agility test in experimental group is statistically significance at significance table value and p-value.so the paired t-test analysis showed that there is significant difference between pre and post agility test results. But the mean difference between the pre and post agility test in control group is 0.28182 at t-value .860, degrees of freedoms (df) 32 and p-value .396. This implies that there is a significance mean difference between the pre test and post test results in experimental groups whereas there is no significance difference in control groups. This difference is due to lack of treatment in control group.

The mean difference between the pre and post balance test was -9.667 at t-value -6.557, degrees of freedoms (df) 29 and p-value 0.000. Here we understood that the mean difference of post and pre paired balance test were statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post balance test results. But in control groups the mean difference between the pre and post test is 0.091 at t-value .144, degrees of freedom (df) 32 and p-value .887.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t-value is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of balance.

The mean difference between the pre and post power test was -0.2840 at t-value -6.657, degrees of freedoms (df) 29 and p-value 0.000. This is statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post power test results. But in control groups the mean difference between the pre and post power test was 0.00364 at t-value .083, degrees of freedoms (df) 32 and p-value .934 which is not significant.

The mean difference between the pre and post speed test was 2.77833 at t-value 7.025, degrees of freedoms (df) 29 and p-value 0.000. This is statistically significance at significance table value and p-value.so the paired t-test analysis showed that there was significant difference between pre and post speed test results in experimental group. But in control group the mean difference between the pre and post speed test was -0.0576 at t-value -.362, degrees of freedoms (df) 32 and p-value .720 which is not significance.

This implies that there is a significance mean difference between the pre test and post test results in experimental groups. This t-value is statistically significant so, based on the pre-post test means of experimental groups, we can say that aerobic exercises have a great effect on the improvement of speed.

3. How does students skill related fitness level differs between the experimental group and the control group in different aerobic exercises?

To answer this research question, the post-pre deviation of the two groups was compared by using independent t-test. The mean difference of agility post-pre deviation result between the experimental and control group was 7.83 second at t-value 10.850 with degree of freedom 61 and p-value 0.000. This is significance because the p-value is less than 0.05 and the t-value is greater than 2 (table value for N = 63). This implies that there is a significance mean difference between the experimental groups and control groups in Agility post-pre deviation results which indicates the effect of aerobic exercises on the improvement of agility.

When we see the mean difference of post-pre balance test between the experimental and control group is 6.788 at t-value 4.653, degrees of freedom (df) 61 and p-value 0.000. This implies that the mean difference between the two groups is significance. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on the improvement of balance because the mean difference is significant at p-value <= 0.05.

The post-pre deviation means difference of power between the experimental and control group is .09770 at t-value 2.071, df 61 and p-value .043. This implies that there is a significance mean difference between the experimental groups and control groups in post-pre deviation mean differences power.

The post-pre deviation means difference of speed between the experimental and control group is 2.16197 second at t-value 5.695 with degree of freedom 61 and p-value 0.000. This is significance because the p-value is less than 0.05 and the t-value is greater than 2 (table value for N = 63). This implies that there is a significance mean difference between the experimental groups and control groups in speed post-pre deviation results. Here we can conclude that teaching aerobic exercises for more than 12 weeks has a significance effect on

the improvement of speed because the deviation mean difference between the two groups is significant.

5.2 Conclusion

The main purpose of the study was to investigate the effect of aerobic exercises on selected skill related physical fitness: the case of Uraga Preparatory School in Guji Zone Oromia Regional State.

As the results of the study revealed, within the delimitation and limitation of this study, based on the data analysis, the conclusion made was that there is a positive effect of aerobic exercises on selected performance related fitness components such as agility, balance, power and speed. This effect was checked by comparing the post test and pre test results of the two groups. The mean difference between the post and pre test results of the four performance related fitness components was significant in experimental groups but this difference is not significant in control groups. This shows that the effect of aerobic exercises on the improvement of performance related fitness components.

There are different effects of aerobic exercises on skill related fitness components. This difference was checked by pairing the post-pre test of the four skill related fitness components in both groups. There is a significant mean difference between post and pre test results of agility, balance, power and speed in experimental groups but there is no significant mean difference in control groups. This shows that the positive effect of aerobic exercises in each skill related fitness components.

The student's skill related fitness level differs between the experimental group and the control group in different aerobic exercises. This difference was checked by taking the post-pre deviation scores of the four skill related fitness components and comparing by using independent t-test. The result shows that, there is a significant mean difference between the experimental and control

groups of the four skill related fitness components. This difference is due to the 12 week aerobic exercises in experimental groups.

5.3 Recommendation

The findings of this research provide that twelve weeks of low, moderate and high intensity aerobic exercise programs significantly altered a selected skill related fitness variable of the participants. Based on these results, discussions and findings of the research, the following recommendations are made.

1. According to the research finding aerobic exercises have a positive effect on agility, balance, power and speed. So Students, athletes and other sport men's, who want to improve skill related fitness components focused more on aerobic exercises than other activities.
2. In this study, the sample size is not large enough which may affect the reliability of study in expressing the differences in student performance of fitness level. The sample sizes of further study should be larger so that the study can be more representative.
3. In this study the extraneous variables like students health status, nutritional habit, rest time and other factors were not controlled during the experiment. So anybody who wants to research on the same area is better to control the extraneous variables because these variables may alter the result of the study.
4. The students being examined in the study were the 16-19 years old; there for, the findings may not be applicable to other age groups. So other researchers can do on other age categories.

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Annex A

Addis Ababa University

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Physical Fitness Measurement record sheet

Student Information

1. Students ID _____

2. Sex Male ☐ Female ☐

3. Age _____

4. Grade _____

5. Group _____

skill-related fitness components	**Tests**	**Pre test Score/ Before Training**	**Post test Score/ After Training**
Agility	Illinois agility run		
Balance	One leg stand		
Power	Standing long jump		
Speed	Flying 30-meter run		

Annex B

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12-week experimental training program

Exercise	Week 1-4 Set x repn	Training intensity	Week 4-8 Set x repn	Training intensity	Week 8-12 Set x repn	Training intensity
Leg extension	2x3	Low	2x2	Low	3x3	medium
Side stretch	2x3	Low	3x2	medium	3x3	Medium
Illinois run	2x3	Medium	2x3	Medium	2x3	Medium
Standing long jump	2x4	Low	2x3	Low	3x4	Medium
30m sprint run	3x5	Medium	2x5	Medium	3x5	Medium
Jump and reach	3x3	Low	3x3	Low	3x3	High
One leg standing	3x3	Medium	3x3	Medium	2x3	Medium
Side lung	3x3	Medium	3x3	Medium	2x3	Medium
Seat stretch	3x4	Medium	3x4	Medium	3x4	Medium
Sit and reach	3x3	Low	2x3	Low	3x4	High

Annex C

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Pre and post test fitness results of experimental group

pre Agility	post Agility	Pre Balance	Post Balance	pre power	post power	pre speed	post speed
24	14.5	5	13	1	1.7	9	9
19.3	12	6	18	1.5	1.6	9.3	6
21	10	8	11	1.2	1.65	10	5.8
22	6	8	10	1.5	1.71	10.5	7
26	8	9	23	1.4	1.65	11	5.6
24	9.6	10	12	1.3	1.56	9.5	9.5
19.5	16	5	10	1.1	1.6	12	8
20	14.5	9	20	1	1.68	13	9
27	10	6	16	1.3	1.59	11.5	7.5
21	15.5	3	8	1.2	1.57	10.25	7
25.3	13	12	12	1.4	1.65	9.7	9.7
17.9	8	7	10	1.5	1.49	10.6	8
21	12.5	8	15	1	1.45	9.4	9.4
19	15.3	13	25	0.9	1.57	13	6
22	10	9	40	0.8	1.39	12.2	9
19.8	15.4	11	34	1	1.25	10.2	6
27	15.5	10	25	1.3	1.65	9.8	9.8
20.5	13.2	6	11	1.15	1.24	8.5	8.5
19.6	10	12	18	1.2	1.4	10	10
21	11	10	15	1.3	1.39	12	7
19.5	10	5	10	1.15	1.15	10.7	8
26	11	4	9	1.2	1.75	11	6
17	12	7	16	1.3	1.45	12	9
18	10	8	13	1	1.67	11.2	9
18.6	14	8	10	1.04	1.15	8.8	8.8
22.5	15	9	12	1.4	1.41	8.2	9
24	14	10	28	1.3	1.15	8.6	6
19.9	12	6	22	1.14	1.22	11	7
18	11	6	37	1.25	1.5	14	9
17.5	11	5	22	1.12	1.23	12	6

Annex D

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Post-pre deviation results of experimental group

Agility deviation result	Balance deviation result	Power deviation result	Speed deviation result
-9.5	8	0.7	0
-7.3	12	0.1	-3.3
-11	3	0.45	-4.2
-16	2	0.21	-3.5
-18	14	0.25	-5.4
-14.4	2	0.26	0
-3.5	5	0.5	-4
-5.5	11	0.68	-4
-17	10	0.29	-4
-5.5	5	0.37	-3.25
-12.3	0	0.25	0
-9.9	3	-0.01	-2.6
-8.5	7	0.45	0
-3.7	12	0.67	-7
-12	31	0.59	-3.2
-4.4	23	0.25	-4.2
-11.5	15	0.35	0
-7.3	5	0.09	0
-9.6	6	0.2	0
-10	5	0.09	-5
-9.5	5	0	-2.7
-15	5	0.55	-5
-5	9	0.15	-3
-8	5	0.67	-2.2
-4.6	2	0.11	0
-7.5	3	0.01	0.8
-10	18	-0.15	-2.6
-7.9	16	0.08	-4
-7	31	0.25	-5
-6.5	17	0.11	-6

Annex E

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Pre and post test fitness results of control group

pre Agility	post Agility	Pre Balance	Post Balance	pre power	post power	pre speed	post speed
22	24	6	9	1.2	1.2	9	10
15	13	5	11	1.5	1.3	11	12
21	21	7	10	1.2	1.15	10	10.7
22	22	6	6	1.5	1.2	10.5	11
26	27	9	12	1.3	1.3	11	12
24	24	10	10	1.3	1	12	11.2
19	20	5	5	1.1	1.04	10	10
21	20	9	4	1.1	1.4	13	13
25	27	6	7	1.3	1.3	11.5	12
21	21	3	8	1.2	1.14	10.25	11
21	19	12	8	1.4	1.25	13	14
18.5	17.9	6	9	1.5	1.12	10.6	11
21	21	8	10	1.02	1.5	11	11
17	19	13	6	0.9	1.2	13	10
20	22	9	13	0.8	1.25	12.2	12
19.8	16	11	8	1.1	1.1	10.2	9
25	27	10	7	1.3	1.5	9.8	9.3
20.5	19	8	12	1.15	1.2	8.5	10
15	12	12	3	1.2	1.5	10	10.5
21	21	10	6	1.3	1.4	12	11
13.5	15	5	9	1.15	1.3	10.7	9.5
26	27	4	5	1.2	1.1	11	12
17	16	7	10	1.3	1	12	13
18	19	8	9	0.9	1.3	11.2	11.5
20	18.6	8	8	1.04	1.2	10	10.25
20	22.5	9	4	1.4	1.4	8.8	9.7
24	24	10	6	1.3	1.5	11	10.6
16	15	5	5	1.14	1	11	10.4
18	19	6	7	1.25	0.9	14	13
17.5	17	3	5	1.12	0.8	12	12.2
22	18	5	4	1.5	1	11	11
24	19	8	5	1.2	1.3	10	9.8
18.5	17	7	6	1.25	1.15	12	11.5

Annex F

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Post-pre deviation results of control group

Agility deviation	Balance deviation	Power deviation	Speed deviation
2	3	0	1
-2	6	-0.2	1
0	3	-0.05	0.7
0	0	-0.3	0.5
1	3	0	1
0	0	-0.3	-0.8
1	0	-0.06	0
-1	-5	0.3	0
2	1	0	0.5
0	5	-0.06	0.75
-2	-4	-0.15	1
-0.6	3	-0.38	0.4
0	2	0.48	0
2	-7	0.3	-3
2	4	0.45	-0.2
-3.8	-3	0	-1.2
2	-3	0.2	-0.5
-1.5	4	0.05	1.5
-3	-9	0.3	0.5
0	-4	0.1	-1
1.5	4	0.15	-1.2
1	1	-0.1	1
-1	3	-0.3	1
1	1	0.4	0.3
-1.4	0	0.16	0.25
2.5	-5	0	0.9
0	-4	0.2	-0.4
-1	0	-0.14	-0.6
1	1	-0.35	-1
-0.5	2	-0.32	0.2
-4	-1	-0.5	0
-5	-3	0.1	-0.2
-1.5	-1	-0.1	-0.5