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**Effects of aerobic exercise on selected health related physical fitness components in the case of werebabo woreda werebabo general secondary and preparatory school; South Wollo zone, Amhara regional state, Ethiopia**

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**Abstract**

The main purpose of this study was to investigate the effect of 12 week aerobic exercise on selected health related physical fitness components. The study design was Experimental method. Simple random sampling technique were used to select subjects as well as to assign subjects for control group (EG) and experimental group (CG) while purposive sampling were used to select the sample sex and the study place, the data were analyzed 60 male sample was taken from a population of 71 male students by Slovincs formula, the selected subjects were divided into 2 equal groups (n=30) CG and (n=30) EG was implemented. Their age range was from 18-22 years. EG who performed in 3 days/week for 3-month aerobic exercise training program like as walking, jogging, running and rope skipping and a CG did not perform this selected aerobic training unless both groups undergone normal physical education class program. Both groups had taken pre, during and post-testing. PT of two groups of 30 subjects (ME was measured by 90° angle push up test, CVE was measured using 12 minute run test, and flexibility was measured using sit and reach test) were recorded. After six weeks of aerobic exercise training, DT was taken in each parameter and a little improvement in each test results was observed and training was continually given by increasing its duration. After three months, posttest measurement on the same parameters was taken. The difference between the tests were analyzed statistically, with paired sample “t” test at the level of significance was  $P < 0.05$  to determine the difference between initial and final mean for participant. According to analyzed data the mean difference value After 12 week’s aerobic exercise boosted in pushup Performance by 1.76, in 12meter run 638mean difference was recorded, and in sit and reach test 0.53increments were observed throughout the study period. The result obtained in this study indicated that there were significant improvement in ME, CVE, and flexibility. Based on this finding, it can be concluded that Moderate aerobic exercise has positive effect on improvement of selected health related physical fitness components of male students.

**Keywords:** aerobic exercise, health related, physical fitness

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**Introduction**

**Background of the Study**

Physical education has long and established tradition in schools, being linked to the development of both body and mind. In other words, it is an important component of the overall school program and integral part of the educational program (Buchres, 1975) [6]. However, Physical education uses physical activity to produce holistic improvements in persons’ physical, mental social & emotional qualities. Physical activity has significant physical health benefits; and it appears to improve health-related quality of life by enhancing psychological well-being and by improving physical functioning in persons compromised by poor health. (USDHHS, 1996) and it is positively associated with health related quality of life (Berger & Motl, 2001). However, physical education provides students with many opportunities to improve their overall life style; first and foremost, it provides students the opportunity to improve their physical fitness, development and health (Brubaker, 2011). There are many factors which help to develop physical fitness, but regular physical activity is the key aspect to achieve optimal physical fitness.

Fitness is the ability of a person to live a full and balanced existence and it is considered as one of the most important health markers in childhood (Ortega *et al*, 2008). also has long been

recognized as one of the primary objectives of physical education an sport. (Wuest & Bucher, 1995). Further, physical fitness is a set of physical attributes that allows the body to respond or adapt to the demands and stress of physical effort.

Physical activity is any bodily movement produced by skeletal muscles that result in energy expenditure. Exercise is a sub category of physical activity; it is planned, structured, repetitive and purposive in the sense that an improvement or maintenance of physical fitness is an objective (Hahn *et al*. n.d 2003).

However proper exercise program, nutrition, adequate rest, good health habits etc. are influencing factors for achieving, maintaining, and improving a considerable level of HRPF. Among the influencing factors the aim of the study want to evaluate the effect of aerobic training on health related physical fitness.

The unique role that quality physical education programs play is to teach the importance of health-related fitness, as well as to develop physical competence and cognitive understanding about physical activity for all students so that they can adopt healthy and physically active lifestyle. (National Association for Sport and Physical Education, 2010).

Physical activity provides in developing health related physical fitness. Garzón (2009) [15] defined health related physical fitness

is the ability of a person to perform daily activities with vigor, and by traits and capacities that are associated with a low risk for the development of chronic diseases and premature death. Hippocrates said that, if all parts of the body are used in moderation it develops and ages slowly. But if left unused, it becomes defective quickly. Therefore, Physical activity is an important ingredient in the quality of life (Singh, 2014) and it is widely acknowledged to children's growth and development (Singapore Ministry of Education, 2005).

Many studies believe that regular physical activity can have immediate health benefits by positively affecting cardio respiratory, musculoskeletal, body composition and flexibility improvement. However the opportunities offered in secondary schools has been decreased in providing physical fitness lessons (Pangrazi & Darst, 2002). In Ethiopian secondary schools physical education curriculum developed one credit hour per week (42 minutes) for classroom as well as practical sessions similarly, in Werebabo general secondary and preparatory school the given credit for PE class is limited. This is too little to improve the physical fitness components required to meet in the grade level with regard to set norms and standards of physical fitness at different age and sex levels

### Scope of the study

The study was conducted in Werebabo General Secondary and Preparatory School that is limited only on some selected grade 12 male students. The investigator focused only male students that they are available as sources of data, so easily compared to girl students and disregarded female students since their participation in physical exercise is too little. The other reason why the investigator wanted to engage into grade 12 is that physical education curriculum fitness test measurements are described in grade twelve PE subjects in chapter two pages 12-25, and he also uses to teach at this grade level.

Based on the above reason this single study were limited on Woreda Preparatory School grade 12 male students.

### Objectives of the Study

1. To measure the effects of aerobic exercise on muscular endurance
2. To evaluate the effects of aerobic exercise on cardiovascular endurance based on pre and posttest result.
3. To examine the significance of aerobic exercise on flexibility.

### Materials and Methods

Research methodology is the corner stone which guide our research. This section includes description and justification of chosen methodology and research methods which are implementing during study. Hence these common elements such as the study area, source of data, study design, sample and sampling techniques, inclusive and exclusive criteria, methods and procedures of data collection, method of data analysis on the effects of aerobic exercise on physical fitness of grade 12 students at Werebabo General Secondary and Preparatory School will be presented respectively in separate section.

### Source of Data

For this study Primary data were used. The Primary data were obtained from experimental variables according to designed

parameters. And the secondary data was collected from various documents, journals, books, internet sources and unpublished booklets.

### Treatment and study Design

Depending upon the nature and appropriateness of the pre, during and post-test data the research approach designed in this study was employed quasi experimental method, since it helps to measure, assess, evaluate and analyze the effect of aerobic exercise on selected health related physical fitness of grade 12 male students at Werebabo General Secondary and Preparatory school. As a result, In this study the investigator was applied aerobic Training programs planned for a period of 12 weeks and administered 3 days a week and for 40-60 min each day on EG. An exercise involving the use of large muscles groups that could be maintained continuously and aerobic in nature was included in the program. These exercises included walking, running, jogging, rope skipping, jumping, distance running, and stretching exercises. There is also practical class training program in the academic schedule of physical education at the school for the whole students one day per week. The exercise session consists of Warm - up period of 7-10 min., and is combined with stretching exercise and progressive aerobic activity mainly lesson related activities. However cool down period were kept for 3 to 7 min. The study was carried out for three consecutive months for training aerobic exercise. In the beginning of the first month (October) pretest was taken and in half of the second month (November) the second test was taken and also at the end of the 3rd month (December) post- test was also administered)

**Table 1:** The Study Design Layout

Treatment	Aerobic exercise program
Frequency	3days/week Total
duration	12 weeks Duration
/session	40-60 minutes
Intensity	Moderate (60-75HRmax)
Exercise days	Monday, Wednesday and Friday
Time of training	Morning

### Study Sample

Participants of this study were grade 12 male students in the study area, who fulfilled the requirements for the study, age from 18-22 years old, free from any impairment or chronic disease, and volunteer in response to the desired study. The participants of this study have believed that they will develop physical fitness during working with the study.

### Sample and Sampling Technique

Simple random sampling technique were used to select subjects as well as to assign as control and experimental groups, while purposive sampling were used to select the sample sex and the study place, the data were analyzed 60 male sample was taken from a total population of 71male students (n=30) CG and (n=30) EG was implemented. All of the students were given one practical physical education lesson per week but 30 of the EG members were given additional aerobic exercise training for three consecutive months. The sample size which was taken from Total population for this study was calculated by Slovincs formula.

$$n = \frac{N}{1 + Ne^2}$$

Where n=the sample size  
 N=the population size  
 e=the margin of error

$$\begin{aligned} n &= \frac{11}{1 + 71(0.05)^2} \\ &= \frac{11}{1 + 71(0.0025)} \\ &= \frac{11}{1 + 0.1775} \\ &= \frac{11}{1.1775} = 60.29 \approx 60 \end{aligned}$$

**Methods and Procedures of Data Collection**

The researcher used quantitative data collection method to collect data from the subjects. by using pre-test, during and post-test through the appropriate health related physical fitness tests including measures, like 12 minutes run/walk test for CVE, 90oangle push up test for muscular endurance, and sit and reach test for flexibility results were collected and recorded by the investigator with the help of assistant who took training for two days. Each test was held at a field of were babo secondary and preparatory school.

**Methods of Data Analysis**

The data collected through fitness tests were analyzed, interpreted and tabulated in to a meaningful idea using manually and in computer in order to compare the selected health related physical fitness components changes which observed among participants that undergoing aerobic exercise program. The data was analyzed using computerized statistical package software (SPSS version 20). Paired sample t-test was used to compare the pre and post training data at level of significance is < 0.05.

**Data Quality Control**

To ensure data quality, all the field test procedures, collection of data's and handling information was carried out in accordance with standard protocols and measurements. And the investigator was use assistant to collect data. And in order to avoid error, training was given for assistant data collector on how to use data collecting instruments and measurements during data collection. And regarding to create awareness about each test the trainers get additional lectures beyond field practices and demonstrations. Only standardized materials were used to keep the quality of the data. Additionally all the above mentioned tests were recorded and fed in to the software twice with different persons to avoid errors in data feeding

**Results and Discussion**

This chapter discussed the analysis of data collected from the samples of study and its results. The purpose of this study was to investigate the effect of three months of aerobic exercise on selected health related physical fitness components among participants of Werebabo woreda Werebabo general secondary

and preparatory school grade 12 students. In this study 60 male students as Subjects. They were divided randomly into two groups equal in number EG (n=30) and CG (n=30) their age was 18-22 years. Aerobic exercise was given for 12 consecutive weeks (three months -October, November, and December). The training included three days per week; with duration of 40-60 minutes and moderate intensity. Measuring tapes, weight machines, exercise mats, marking cones, stopwatch, jumping ropes, record sheets, paper, pen and whistle were used during training.

The variables selected for this study were health related physical fitness components such as Muscular endurance, cardiovascular endurance and flexibility. Pre, during and posttest were conducted for all the 60 subjects on some selected health related physical fitness components and the scores were recorded. Information of subject's participation in this research project was kept confidential. Records pertaining to this research were coded secretly in numbers and put in a secured storage area. The collected data were analyzed by t-test by using SPSS. The results for each fitness variables are discussed below.

**Characteristics of study participants and physical fitness variables**

**Table 2:** Characteristics of the study participants

Group	N	Age		Height		Weight	
		Mean	S.D	Mean	S.D	Mean	S.D
EG	30	19.35	.933	1.7310	.0766	54.025	5.495
CG	30	19.80	1.105	1.719	.0717	55.900	5.548

As shown from above Table 2 Descriptive characteristics of 60 study participants from Werebabo preparatory school mean of age (EG=19.35, CG=19.80) height (EG=1.73, CG=1.72) and weight (EG=54.03, CG=55.9). Subjects were relatively had the same age, height and weight at the beginning of exercise.

**Effects of Aerobic Exercise on Muscular Endurance**

**Table 3:** The mean value of ME (90oangle push up test) for CG and EG

P Group	Test	PT(X±SD)	DT(X±SD)	PoT(X±SD)	(ΔX)PT and PoT
EG	90o angle pushup test	25.97±6.04	26.80±6.18	27.73±6.24	1.76
CG	90o angle pushup test	25.77±10.00	25.83±9.75	25.87±9.90	0.1

ME=Muscular endurance EG= experimental groups, CG=control group X=mean value of each tests, SD= Standard deviation, ΔX= (MD) mean difference, PT=pretest result, DT= during training result, PoT= post test results, p=significance level

As shown from table 4 the average pretest score of EG (N=30) was found to be 25.97 with a standard deviation of 6.04 and CG (N=30) was found to be 25.77 with an SD of 10.00 from this data we can see that the scores in the pretest for both groups were close. After six weeks EG mean score was 26.80 with SD 6.18 and CG mean score of 25.83 with SD score 9.75. In contrast, the average post test score after 12 week aerobic exercise training of EG was found out 2s7.73 with SD of 6.24 and for CG mean 25.87 with SD of 9.90. From this data we can see that the scores in the posttest for both groups (EG and CG) were very different. One can pick up that these numbers in pretest and posttest mean scores (achievement levels) are different. Hence, these data indicated

that there is a significant difference and gradual improvement between PT, DT and PoT test results of EG and there is deficient improvement between PT, DT and PoT test results of CG.

The result of this finding was consistent with the finding of shahana and his friends, who conducted the study on the effects of a twelve-week aerobic exercise program on selected health related physical fitness components in adults (Shahana *et al.*, 2010) [20]. Similarly Harms and his friends who conducted DURING aerobic exercise, minute ventilation increases and an increased load is placed on the respiratory muscles. Both the frequency and the speed of contraction in the muscle are increased, (Harms *et al.*, 2000) [16].

**Effect of Aerobic Exercise on Cardiovascular Endurance**

**Table 4:** The mean value of CVE (12 minutes run/walk test) for EG and EG

Group	Test	PT(X±SD)	DT(X±SD)	PoT(X±SD)	ΔX)PT And PoT	P
EG	12minute run test	2865.00±270.42	3140.00±252.36	3503.00±181.43	638	0.000
CG	12minute run test	2933.67±322.50	2935.80±317.24	2937.97±318.52	4.2	0.709

CVE=cardiovascular endurance EG= experimental groups, CG=control group X=mean value of each tests, SD= Standard deviation, ΔX= (MD) mean difference, PT=pretest result, DT= during training result, PoT= post test results p=significance level.

As shown from table 5 the average pretest score of EG (N=30) was found to be 2865.00 with a SD of 270.42 and CG (N=30) was found to be 2933.67 with an SD of 322.50 from this data we can see that the scores in the pretest for both groups were near. After six weeks EG score was 3140.00 with SD 252.36 and CG mean score of 2935.80 with SD score 317.24. In contrast, the average post test score after 12 week aerobic exercise training of EG was found out 3503 with SD of 181.43 and for CG mean 2937.97 with SD of 318.52. From this data we can see that the scores in the posttest for both groups were very different. One can pick up that these numbers in pretest and posttest mean scores (achievement levels) are different. Hence, these data indicated that there is a significant difference and gradual improvement between PT, DT and PoT test results of EG and there is no sufficient improvement between PT, DT and PoT test results and there is no improvement between PT, DT and PoT test results of CG As a result this study consistent with findings of Mahendran, (2009) that conducted with selected health related variable cardiovascular endurance was measured using 12-minutes run. The results of pre and posttest were compared by using Analysis of Covariance. The variable was significantly improved among experimental group. Similar study Chao-Chien, & Yi-Chun, (2012) also showed on their findings of jumping rope training demonstrated significant effects on cardiovascular endurance. Moreover, Shahana *et al.*, (2010) [20] also conclude that improved cardiovascular endurance among the experimental group of middle-aged adults after 12 weeks of aerobic exercise. Toy, (2008) also after twelve weeks of aerobic dance training a significant in vo2 max cardio respiratory

fitness among middle aged adults. In the case of control group no significant changes were seen in any of the selected studies

**Effect of Aerobic Exercise on Flexibility**

**Table 5:** The mean values of flexibility (sit and reach test) for EG and CG

Group	Test	PT(X±SD)	DT(X±SD)	PoT(X±SD)	ΔX)PT and PoT	P
EG	Flexibility	14.93±5.61	15.14±5.53	15.46±5.44	0.53	0.000
CG	Flexibility	14.69±5.57	14.73±5.58	14.79±5.62	0.1	0.212

EG= experimental groups, CG=control group X=mean value of each tests,SD= Standard deviation, ΔX= (MD) mean difference, PT=pretest result, DT= during training result, PoT= post test results p=significance level

As shown from table 6the average pretest score of EG (N=30) was found to be 14.93with a SD of 5.61 and CG (N=30) was found to be 14.69 with an SD of 5.57. From this data we can see that the scores in the pretest for both groups were close. After six weeksEG mean score was 15.14 with SD 5.53and CG mean score of 14.73 with SD of5.58. In contrast, the average post test score after 12 week aerobic exercise training of EG was found out 15.46 with SD of 5.44 and for CG mean 14.79 with SD of 5.62. From this data we can see that the scores in the posttest for both groups were very different. One can pick up that these numbers in pretest and posttest mean scores (achievement levels) are different. Hence, these data indicated that there is a significant difference and improvement between PT, DT and PoT test results of EG and there is no improvement between PT, DT and PoT test results of CG.

**Comparison of three tests (900 pushup,12 minutes run,sit and reach) results of EG**

**Table 6:** Changes of 12 weeks aerobic exercise in the selected health related physical fitness components (ME, CVE, FLEXIBILITY)

P Type of test	PT(X±SD)	DT(X±SD)	PoT(X±SD)	ΔX)PT and Pot
ME (900Push up)	25.97±6.04	26.80±6.18	27.73±6.24	1.76
CVE(12 Minutes run)	2865.00±270.42	3140.00±252.36	3503.00±181.43	638
Flexibility (sit and reach test)	14.93±5.61	15.14±5.53	15.46±5.44	0.53

ME= Muscular endurance, CVE=Cardiovascular endurance X=mean value of each tests, SD= Standard deviation, ΔX= (MD) mean difference, PT=pretest result, DT= during training result, PoT= post test results p=significance level.

The above table showed that EG there was significance difference in between the pre to post test score of (900 pushup test, 12 minutes run/walk test, sit and reach test) results due to twelve week aerobics exercise in the selected health related physical fitness components (ME, CVE and Flexibility) all test had changes was due to Aerobic exercises in which they were engaged in. the mean score value of ME pretest before training result was (25.97) and posttest after training mean score values was (27.73) The mean difference score of pretest with mean difference score of posttest mean difference value increased by (1.76). As indicated the tables mean value of CVE from pretest 2865.00 increased to 3503.00 posttest.



CVE score of pretest to posttest mean difference value of EG increased (638) recorded.

The mean value of flexibility from pretest 14.93 increased to 15.46 posttest result. Flexibility score of pretest mean to posttest mean difference value of EG increased (0.53) recorded.

When we compare the pretest and posttest of mean difference value score in each test of 12 weeks Aerobic exercise intervention experimental groups. The first Better change observed on CVE=22.3%, second on ME=6.8%, and lowest score of mean difference value was FLEXIBILITY=3.5% respectively. The improvement rate of this data was one indicator of the great Aerobic exercise training effect on CVE=22.3% than others components. Therefore, aerobic exercise training was important for increment of CVE according to the result on this study.

## Summary, Conclusions, and Recommendations

### Conclusion

The purpose of this study was to evaluate the associations between aerobic exercises with selected health related physical fitness components in grade twelve students in case of South Wollo Zone Werebabo Wereda Werebabo general secondary and preparatory school. Data was drawn from a pre and posttest after 12 weeks of aerobic exercise training within selected physical fitness tests i.e. 900 angle push up to assess ME, 12 minute run/walk to assess CVE and sit and reach test to assess flexibility administered to selected sample male subjects (N=60). As a result, the following conclusion was made. This study indicate that aerobic exercise has its own advantage on improving students health related physical fitness particularly ME, CVE, and flexibility on the aerobic exercise EGs showed a significant difference ( $p < 0.05$ ) on the above components compared with control group.

### Recommendations

#### Based on the findings of the study, the following suggestions are forwarded

Aerobic exercise programs should be incorporated and encouraged into the physical education lessons at school. Such programs should consider all the three health-related physical fitness components. This will help to improve the health-related physical fitness deficiencies of students.

Students should be active participant at least 3 days per week aerobic exercise training to improve their health related physical fitness status. Thus, physical education class per week should be increased and contents should emphasis on aerobic exercises.

Physical education teachers as a means to improve the general fitness status of all students, recreational and sporting competitions should encourage among various classes and grade levels. Further, they should be serious on students' practical session plan implementation.

School administrator should encourage and finance students' sport club in order to have more participation of students and to monitor their fitness status

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