

# Comparative Effects of Aerobic and Anaerobic Workouts on Performance Enhancement of Selected Physical Fitness Variables among First Year Sport Science Students of Wolaita Sodo University, Ethiopia

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**Abstract-** The study was conducted to compare the effects of aerobic and anaerobic workouts on performance enhancement of selected physical fitness variables among first year Sport Science students at Wolaita Sodo University. Thirty (15 male and 15 female) students from Sport Science department were selected as subjects and their age were 19 - 21 years. Subjects were randomly assigned to aerobic training group (5 male, 5 female,) anaerobic training group (5 male, 5 female) and control group (5 male, 5 female). The experimental groups were participated in a supervised aerobic and anaerobic training program 3 days/week for 12 weeks. The control group did not participate in any of the program. The physical fitness variables selected for the study were: cardiovascular endurance, muscular strength, muscular endurance, flexibility, body composition and Agility. Data were analyzed using ANOVA and multiple comparison of post test means were held to discover which treatment means differ at 95% confidence interval by using Fisher's LSD. The results obtained in this study indicate that there was significant improvement in selected physical fitness variables due to the effects of aerobic and anaerobic training ( $p < 0.05$ ). This study proved that aerobic exercise was significantly better than anaerobic exercise in improving cardiovascular endurance and flexibility ( $p < 0.05$ ) and anaerobic exercise was significantly better than aerobic exercise in improving muscular endurance, muscular strength and agility ( $p < 0.05$ ) while both exercises had almost the same effect in improving the body composition of the participants.

**Index Terms-** aerobic exercise, anaerobic exercise, performance enhancement, physical fitness variables.

## I. INTRODUCTION

Life will not be life without the presence of physical activities. Regular exercise is necessary to develop and maintain an optimal level of health, performance and appearance. It makes us to feel good both physically and mentally (Michaud and Narring, 1996). In the 21<sup>st</sup> century, it has become necessary to think about the ways to increase the physical fitness capacities of human beings and to sustain those potentialities. The research in that direction will definitely help the future generations to understand

the type of exercise that develops the specific physical fitness variables.

Physical fitness is the biggest potentiality of human being. It can not be bought. It can only be achieved through day to day physical activity (Bharath and Mukesh, 2011). The American College of Sports Medicine describes aerobic exercise as "any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature". Anaerobic activity may target large or small muscle groups and differs from aerobic activity in that it involves short bursts of strenuous exertion, followed by periods of rest. Aerobic activity generally has a low to moderate-intensity and long duration, while anaerobic activity is highly intense and short-lasting (Suzanne, 2011).

The greatest benefits of regular aerobic and anaerobic exercises are probably well known theoretically for students of Sport Science. Since aerobic exercise can be sustained for long periods of time, it increases the strength and size of the heart and the efficiency of the lungs, increases the body's endurance and lowers blood pressure. Anaerobic training is beneficial in building muscle mass, which results in faster calorie-burning during exercise and a heightened metabolism. This allows the body to burn fat more quickly, and it can allow an athlete to eat larger portions of food without gaining weight (Gregory, 2009).

The general objective of this research study was to compare the effects of aerobic and anaerobic workouts on performance enhancement of selected physical fitness variables. The specific objectives were to investigate the significance of aerobic and anaerobic workouts on improving selected physical fitness variables of students, to evaluate the physical fitness improvements of students after the aerobic and anaerobic workouts have been given and to compare the obtained physical fitness results and status of students.

## II. MATERIALS AND METHODS

### The Study Design

A complete randomized block design was used for this research study. The block was based on gender (male or female). Participants were assigned to blocks, based on gender. Then, within each block, participants were randomly assigned to treatments.

**Sampling Size and Sampling Techniques**

Simple random sampling technique was used to identify the groups and for treatment allotment. The experimental groups were divided in to two i.e. aerobic and anaerobic. Thus, totally there were three groups. The three groups contain 10 (5 male and 5 female) students for aerobic group, 10 (5 male and 5 female) students for anaerobic and 10 (5 male and 5 female) students for control group.

**Methods of Data Analysis**

The data collected through fitness tests were analyzed interpreted and tabulated in to a meaningful idea using manually and software in order to compare the selected physical fitness variable changes observed in all three group participants. To test the statistical significance of the treatments, the data was analyzed through SAS version 8.12 and analysis of variance (ANOVA) was computed. Further; multiple comparison analysis on post test mean was done with Fisher’s LSD at the 0.05 levels of significance.

**Training Schedule**

**Table 1: Pre, post and mean difference values for cardiovascular endurance of the participants**

Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	76.80	77.70	75.40	0.18	11.18	7.87
POT	112.60	91.90	79.40	71.83*	6.61	5.75
MD	35.80	14.2	4			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

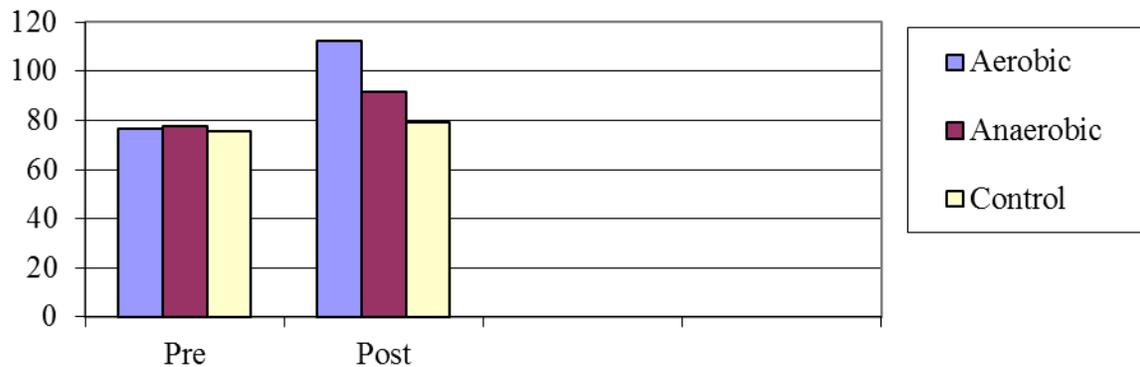
As indicated in Table 1, the pre test mean showed that at initial stage there was no significant difference between the groups. The multiple comparisons on post test data proved that due to 12 weeks treatment the significant difference existed in between the groups. The post test mean difference value was 20.7 between aerobic and anaerobic group, 33.2 in aerobic and control group and 12.5 in between anaerobic and control group. This indicates that there was significant difference between

The training program lasted for about 12 weeks. Participants were trained three times a week. It was done twice a week in the gymnasium and once a week outdoor (in the field). The sessions were taken in two different groups as aerobic and anaerobic group. Each aerobic exercise session involves a 10 minute warming up period, followed by at least 20-30 minutes of moderate intensity exercise involving the large muscle groups for the first 6 weeks and gradually increased up to 40 minutes for the next 6 weeks. In anaerobic group participants were engaged in stations of 5-8 exercise. For anaerobic group the participants were trained in a 1:1 work/rest ratio for a few weeks and progress to a 2:1 work/ rest ratio for about 30-40 minutes. Ten minutes time was given for warming up and 5 minutes for cool down exercise. No program was given to control group; they were continuing with their own daily routine.

**III. RESULTS AND DISCUSSIONS**

aerobic and anaerobic group, aerobic and control group and anaerobic and control group. In this study the cardiovascular endurance of participants were improved due to 12 weeks aerobic and anaerobic training programs and aerobic group was found to be significantly better than anaerobic groups in improving the cardiovascular endurance of the participants. The graphical representation of mean values of cardiovascular endurance of the participants has been exhibited in figure 1

**Figure 1: Comparative analysis of pre and post test data of participants on cardiovascular endurance (scores in ml kg<sup>-1</sup>min<sup>-1</sup>)**



**Table 2: Pre, post and mean difference values for muscular strength of the participants**

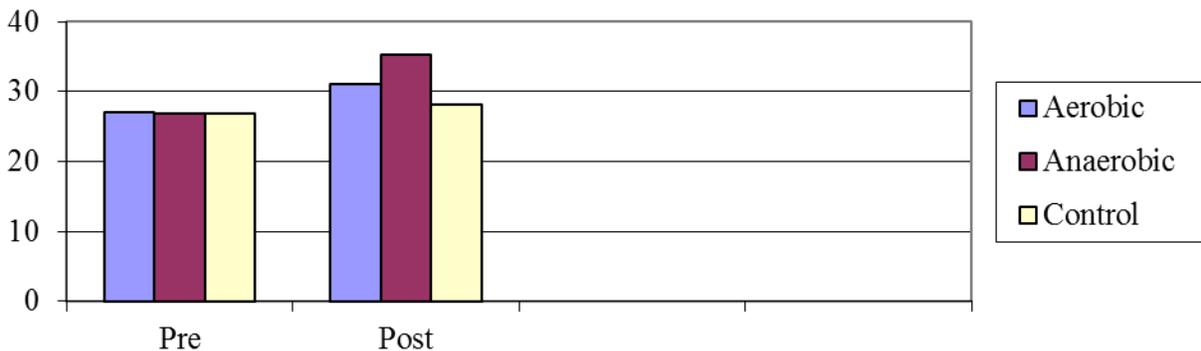
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	27.10	26.90	26.80	0.02	12.33	3.05
POT	31.10	35.30	28.20	5.70*	14.99	4.34
MD	4	8.4	1.4			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

Table 2 showed that the mean difference between pre and post test was 4, 8.4 and 1.4 for aerobic, anaerobic and control groups respectively. The mean difference value of post test means was 4.2 between anaerobic and aerobic group, 2.9 aerobic and control group and 7.1 anaerobic and control group. The multiple comparison analysis proved that there was no significant difference between aerobic and anaerobic and aerobic and control group as the mean difference value between the groups was less than the LSD value of the group (4.34). In this study, the

participant’s muscular strength significantly improved because of anaerobic and aerobic exercises which enabled the subjects to perform significantly better in pushups than that of the control group counterparts. Even though both exercises show significant improvements on the muscular strength of the participants the post test mean difference was higher in anaerobic group than that of aerobic group. The graphical representation of mean values of muscular strength of the participants has been exhibited in figure 2

**Figure 2: Comparative analysis of pre and post test data of participants on muscular strength (scores in number)**



**Table 3: Pre, post and mean difference values for muscular endurance of the participants**

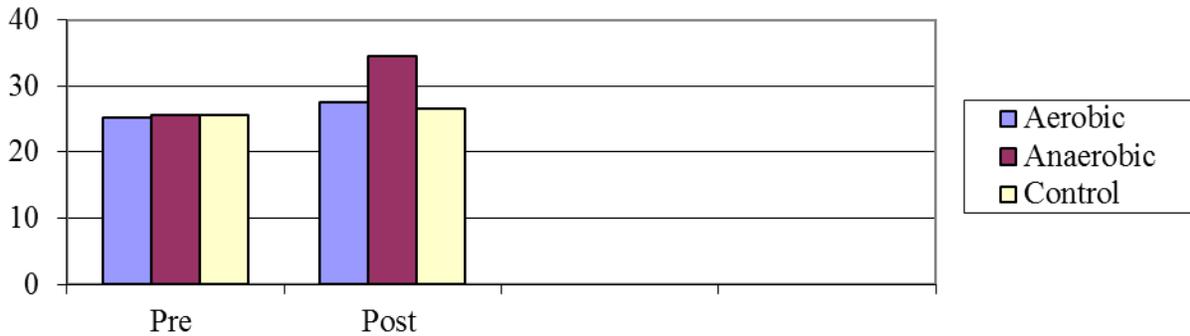
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	25.30	25.60	25.70	0.03	14.38	3.37
POT	27.60	34.50	26.60	13.80*	12.38	3.36
MD	2.3	8.9	0.9			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

As indicated in Table 4, the pre test mean was almost the same for all groups. This showed that in their initial level the groups were almost the same in their physical fitness performance. The multiple comparisons showed that there was significant difference between the post test means of the groups. The post test mean difference of anaerobic and aerobic group was 6.9 and anaerobic and control group was 7.9. There was no

significant difference between aerobic and control group as the mean difference 1 was less than that of the LSD value of 3.36 at 5% level. Therefore, anaerobic exercise was recommended for those who want to develop their muscular endurance. The graphical representation of mean values of muscular endurance of the participants has been exhibited in figure 3

**Figure 3: Comparative analysis of pre and post test data of participants on muscular endurance (scores in number)**



**Table 4: Pre, post and mean difference values for flexibility of the participants**

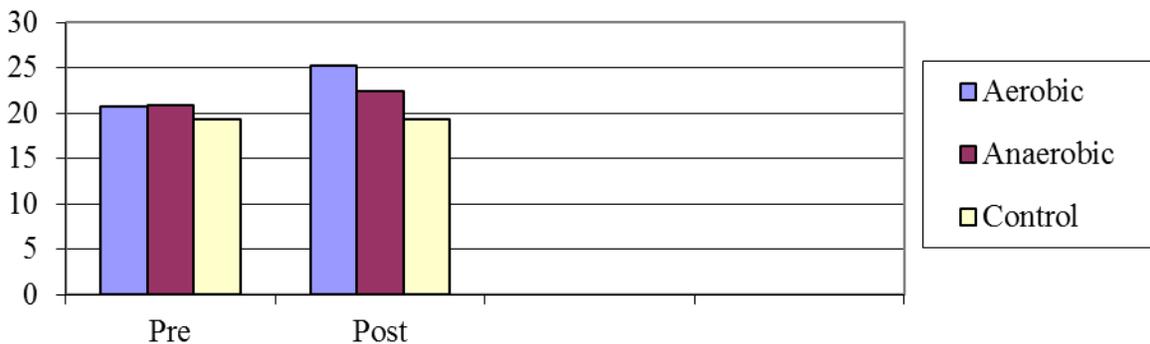
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	20.74	20.89	19.38	0.34	22.32	4.17
POT	25.33	22.45	19.35	4.27*	20.46	4.20
MD	4.59	1.56	-0.03			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

The data Table 5 showed that the pre test mean scores of flexibility in aerobic group was 20.74, anaerobic group 20.89 and control group 19.38. The post test means of aerobic (25.33) and anaerobic groups (22.45) showed improvements over the pre test scores. The post test mean difference was recorded as 2.88, 5.98 and 3.1 between aerobic and anaerobic, aerobic and control and anaerobic and control group. The multiple comparisons showed that there was significant difference between the post test means

of aerobic and control group. But no significant difference was observed between aerobic and anaerobic as well as anaerobic and control group. Thus, aerobic exercise was more effective in enhancing the flexibility of the participants than that of anaerobic exercise. The graphical representation of mean values of flexibility of the participants has been exhibited in figure 4

**Figure 4: Comparative analysis of pre and post test data of participants on flexibility (scores in centimeter)**



**Table 5: Pre, post and mean difference values for body composition of the participants**

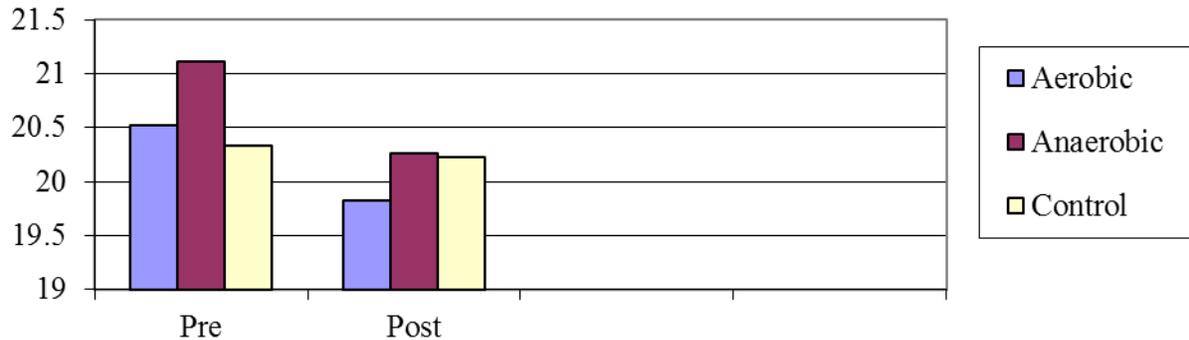
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	20.52	21.11	20.33	0.43	9.58	1.82
POT	19.83	20.26	20.23	0.17	9.01	1.66
MD	-0.69	-0.85	-0.1			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

Table 6 indicate that the difference among pre and post test mean of aerobic group (-0.69), anaerobic group (-0.85) and control group was (-0.1). The mean difference showed a slight reduction over the pre test due to training program. The post test mean difference value was 0.43 between aerobic and anaerobic group, 0.4 aerobic and control group and 0.03 anaerobic and control group. The multiple comparisons proved that no

significant difference existed between the post test means of all groups since all mean difference values was less than the LSD value of the groups (1.66) at 0.05% level. The improvements in this study were not significant. The graphical representation of mean values of body composition of the participants has been exhibited in figure 5

**Figure 5: Comparative analysis of pre and post test data of participants on body composition (scores in percentage)**



**Table 6: Pre, post and mean difference values for agility of the participants**

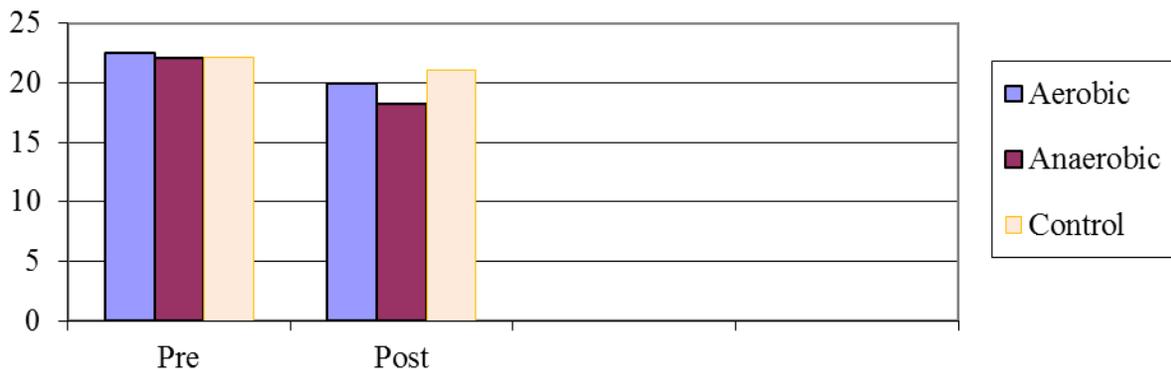
Test	Aerobic group	Anaerobic group	Control group	F value	CV%	LSD
PT	22.49	22.06	22.14	0.25	6.46	1.32
POT	19.99	18.21	21.11	11.72	6.83	1.24
MD	-2.5	-3.85	-1.03			

PT= pre training, POT= post training, MD= mean difference, CV=coefficient of variance LSD=least significant difference, \* Significant

As indicated in Table 7, the pre test mean was almost the same. The post test mean for aerobic group was 19.99, anaerobic group 18.21, and control group mean was 21.11. The mean difference was -3.85 for anaerobic group, -2.5 for aerobic group and -1.03 for control group. The post test mean difference between aerobic and anaerobic group was 1.78, aerobic and control group 1.12 while it was 2.9 for anaerobic and control group. The multiple comparisons showed that there was significant difference between the post test means of aerobic and

anaerobic and anaerobic and control groups. But there was no significance difference between aerobic and control groups as the mean difference 1.12 was less than the LSD value of 1.24 at 5%. Thus, it was proved that aerobic and anaerobic group improved agility of the participants compared to control group and anaerobic group was better than aerobic group in improving agility of the participants. The graphical representation of mean values of agility of the participants has been exhibited in figure 6

**Figure6: Comparative analysis of pre and post test data of participants on agility (scores in seconds)**



#### IV. CONCLUSION

Within the limitations and delimitations of the study, the following conclusions were drawn:

- Aerobic and anaerobic exercise programs significantly improved selected physical fitness variables, cardiovascular endurance, muscular strength, muscular endurance flexibility and agility of the participants.
- Aerobic exercise was found better than anaerobic exercise in improving cardiovascular endurance and flexibility performance of the participants.
- Anaerobic exercise was better than aerobic exercise in improving muscular strength, muscular endurance and agility of the participants
- Both aerobic and anaerobic exercise programs had no effects in improving body composition of the participants provided that the participants are in their ideal weight.
- There was no significant improvement observed on control groups.

#### REFERENCES

- [1] publication),” *IEEE J. Quantum Electron.*, submitted for publication.
- [2] Bharath, M. and G. Mukesh, 2011. A Comparative Study of Physical Fitness of Central, Navodaya and Adarsh Residential Schools’ Students of Gujarat State. *Asian Journal of Physical Education and Computer Science in Sport*, 4(1):41-42.
- [3] Gregory, H., 2009. Aerobic & Anaerobic Training Benefits. <http://www.mastersoccer.net>. Accessed on June 2013
- [4] Michaud, P.A. and F. Narring, 1996. Physical Fitness in Children and Adolescents. *Arch-Pediatr.*, 35: 497-504.
- [5] Suzanne, M., 2011. compare contrasts aerobic and anaerobic exercise [www.livestrong.com/articles/341845](http://www.livestrong.com/articles/341845). Accessed November 22/2012

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