EFFECT OF COMBINED AEROBIC AND RESISTANCE TRAINING ON SELECTED HEMATOLOGICAL PARAMETERS AND HEALTH RELATED FITNESS COMPONENTS OF HARAMAYA UNIVERSITY SPORT SCIENCE 1ST YEAR MALE STUDENTS, OROMIA REGIONAL STATE, ETHIOPIA

MSc. THESIS

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Effect of Combined Aerobic and Resistance Training on Selected Hematological Parameters and Health Related Fitness Components of Haramaya University Sport Science 1st Year Male Students, Oromia Regional State, Ethiopia

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As a research advisor we hereby certify that we have read and evaluate this thesis entitled **"Effect of Combined Aerobic and Resistance Training on Selected Hematological Parameters and Health Related Fitness Components of Haramaya University Sport Science 1st Year Male Students, Oromia Regional State, Ethiopia."** prepared by Zewdie Wondimagegn Alemu. We recommend that it can be submitted as a fulfillment of the thesis requirements.

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As a member of the Board of Examiners of MSc. Thesis Open Defense Examination, we certify that we have read and evaluate the thesis work prepared by Zewdie Wondimagegn Alemu and examined the candidate. We recommend that the thesis be accepted as fulfilling the requirements for the Degree of Master of Science in Sport Medicine.

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Final approval and acceptance of the thesis is contingent upon the submission of its final copy to the council of Graduate studies (CGS) through the candidates department or school graduate committee (DGC or SGS).

DEDACTION

I dedicate this thesis to my beloved sister Selam Wondimagegn.

STATEMENT OF THE AUTHOR

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ACRONYMS AND ABBREVIATIONS

CBC	Complete Blood Count
CT	Combined Training
CVD	Cardio Vascular Disease
Hct	Hematocrit
Hgb	Hemoglobin
HU	Haramaya University
IPAQ	International Physical Activity Questionnaire
Rbc	Red Blood Cell
RET	Resistance Exercise Training
Wbc	White Blood Cell
WHO	World Health Organization

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ABSTRACT

The purpose of the present study was to find out the effect of combined aerobic and resistance training on selected hematological parameters and health related fitness components of Haramaya University sport science academy1st year male sport science students from December to February 2019 ,true pre post experimental design were used. To accomplish this study untrained 45 (forty five) young male adults who were volunteer to participate in the study from the main campus of Haramaya university 1st year Sport Science Academy. The study was following a repeated-measuring of single group of pre and post experimental design. The experimental treatment was 12 weeks of combined aerobic and resistance exercise. Measurements were obtained at two times during the intervention period; 2 days before the 12 weeks of combined training, and 2 days after the last session of the end 12 weeks of combined training period. Paired sample t - test was used to test the null hypothesis. Statistical analyses were carried out using SPSS software version 20.0.The selected hematological pre and post mean results were (Wbc8.18 ±2.15 and 6.26 ± 1.96, Rbc 4.98±1.14 and 5.29 ± 1.21, Hgb 15.45 ± 1.04 and 16.23 ± 0.92, Hct 47.68±3.13and 50.86± 2.82, Plt 391.8± 61.83and 460.38±61.32) and health related fitness component (strength endurance; 22.93±9.54 and 27.27± 8.11, flexibility; 12.46±7.18 and 16.42 ±6.03). The present study showed that combined aerobic and resistance exercise training has a significance change on selected hematological parameter and health related fitness components. Based on the finding it has been recommended that further research is necessary in the area of combined aerobics and resistance exercise training on hematological parameters and health related fitness components not only in moderately active students but also in other sport men and women.

Key words: Resistance training. Aerobics exercise, Hematology

1. INTRODUCTION

1.1. Background

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure. It is very important to have a fresh mind before any work, like office work, study or some creative work. Regular Physical activity and exercise can help you stay healthy, energetic and independent as you get older. It can reduce stress and anxiety, boost happy chemicals improve self-confidence, increase the brain power, and sharpen the memory and increase our muscles and bones strength (Elmagd, 2016).

There is strong evidence that children and adolescents benefit from physical activity through improved cardio respiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers; there is a growing body of evidence that inactive children are more likely to become inactive adults. In order to stay in good health, it is recommended to participate in both endurance and strength type activities several times a week (Haskel *et al*., 2007).

Resistance training (weight training) involves an exercise in which the muscles exert a force against an external load. It should be individualized, progressive and specific in terms of the way muscles are likely to be used in the chosen sport. Resistance exercise training (RET) or strength training has become most popular forms of exercise both for enhancing an individual's physical fitness and for conditioning in athletes (Fleck and Kraemer, 1997). The physiological response to dynamic aerobic exercise is an increase in oxygen consumption and heart rate that parallels the intensity of the imposed activity and a curvilinear increase in stroke volume. A lot of action is done in the body which changes the internal environment of chemical component, for example some changes will occur by contraction of muscles (Bhasha*et al.*,2014; Shaw *et al*., 2015).

Researches show that exercise has positive effects on physical, physiological, psychological and motorial characteristics (Fox *et al*., 1999; Hazar and Yılmaz, 2008). It seems to be different that regular exercises have effects on the levels of blood cells. Depending on any exercise type, intensity and time, changes occur in hematological parameters. Probably these changes result from factors such as methods used in tests, test periods, exercise types applied,

subjects' ages and genders, training situations (Shephard and Shek, 1994; Büyükyazıand Turgay, 2000).

Aerobic exercise improve O_2 consumption increased cardio-respiratory endurance, which in turn increased Vo_2 max, because of it is increased level of hemoglobin to exercises, based on recent findings, lead to decreases in hemoglobin (Hgb) concentration, the number of erythrocytes, and hematocrit percentage, which, in itself, reflects anemia originating in physical activities and exercises (Shaske and Green, 2000; Schumacher *et al*., 2002; Convertino, 1991). Long duration aerobics training decrease in red blood cell count and hemoglobin content. Some studies shown that sports persons have lower values of Hgb and RBC in comparison to counterparts not engaged in any kind of regular exercise. Performing high intensity resistance exercise promotes greater energy expenditure during a subsequent aerobic session (Guyton and Hall, 2001)

It is believed that resistance and aerobic training done separately will cause significant increases in energy expenditure (Fukuba, *et al*., 2002). Due to time constraints and convenience it is common to perform both aerobic and resistance exercise in a single session, a strategy known as combined exercise (Drummond *et al*.,2005; Pauletto, 2005).

1.2. Statement of the Problem

It is a well-known fact that regular exercise is an excellent preventive and curative way for conditions like heart disease, high blood pressure, type-2 diabetes mellitus, back pain, osteoporosis and last but not least obesity. Many scholars have tested the effect of different exercise types independently and got ambiguous results. Resistances exercise increased hematological parameters in young boys (Niaki and Tayebi, 2013; Singh, 2017).Aerobic training, resistance training and concurrent training increased erythrocytes of college boys independently (Umarani and Shelvam, 2015).

Endurance exercises over a longer duration tends to reduce the hemoglobin and red blood cell count in human beings to an extent which is more of beneficial than detrimental to the body (Sanghavi *et al.*,2012; Singh, 2017). But in other study conducted chronic aerobic training program increased hemoglobin level and red blood cell count in human blood (Yeshbeer, 2017). This indicates that the results are not consistent, therefore further study is required.

Most of the previous researches regarding this area test the effect of aerobic and strength exercise independently. In this study both exercise types (aerobic and resistance) was combined on selected hematological parameters (Rbc, Hgb, Hct, platelet and Wbc) and some health related fitness components in a combined way.

At various durations and intensities, including measurements of hemoglobin levels, platelet and leukocyte counts, has been previously investigated and found that; Hemoglobin (Hgb), platelet numbers and Leukocyte numbers has been shown to increase in the circulation immediately after exercise (Wardyn *et al*., 2008; Ranbir, 2017; Mairbäurl, 2013). Literature on chronic adaptation of selected hematological parameters and health related fitness as a result of combined aerobic and strength training scare are not well understood. As a result the study was conducted on this area in Haramaya university first year male Sport Science students. Therefore the research was focused on the following research hypothesis.

H_O Combined exercise training has no significant change on White Blood cell
H_A: Combined exercise training has significant change on White Blood cell
H_O: Combined exercise training has no significant change on Red Blood cell
H_A: Combined exercise training has significant change on Red Blood cell
H_O: Combined exercise training has no significant change on Hemoglobin
H_A: Combined exercise training has significant change on Hemoglobin
H_O: Combined exercise training has no significant change on Hematocrit.
H_A: Combined exercise training has significant change on Hematocrit.
H_O: Combined exercise training has no significant change on Platelet.
H_A: Combined exercise training has significant change on Platelet.
H_O: Combined exercise training has no significant change on Strength endurance.
H_A; combined exercise training has significant change on Strength endurance.
H_O: Combined exercise training has no significant change on Flexibility.
H_A: Combined exercise training has significant change on Flexibility.

1.3. Scope of the Study

This study was limited to only 45(forty five) subjects of apparently healthy Haramaya University first year male Sport Science students of age 19- 22.Combined

aerobic/endurance and resistance/strength training for twelve weeks was the independent variables. Selected hematological variables (Wbc, Rbc, Hct, Hgb and platelet) , flexibility and strength endurance were the dependent variables.

1.4. Significance of the Study

The end result of this study would help the general population by identifying the effect of combined aerobic and resistance training on their selected hematology and benefit by improving their some health related fitness components. The findings also help in filling the observed gaps in that the model of the exercise with optimal adaptation was used for clinical interventions. Athletes also benefit from such kind of training to maintain and develop their fitness and health.

1.5. Objective of the Study

1.5.1. General Objective

The general objective of the study was to determine the effects of combined strength and aerobic physical exercise training on selected hematological parameters (Wbc, Rbc, Hgb, Hct and platelet) and health related fitness components (flexibility and strength endurance) of Haramaya University first year male Sport Science students.

1.5.2. Specific Objective

- To measure the effects of combined aerobic and strength physical exercise on white the blood.
- To identify the effects of combined aerobic and strength physical exercise on red blood cell.
- To examine the effects of combined aerobic and strength physical exercise on hemoglobin
- Determine the effects of combined aerobic and strength physical exercise on platelet level.
- Determine the effects of combined aerobic and strength physical exercise on hematocrit level.
- Determine the effects of combined aerobic and strength physical exercise on flexibility.
- Determine the effects of combined aerobic and strength physical exercise on muscular endurance of Haramaya university sport science academy 1st year male students.

1.6. Operational Definition of Terms

Aerobic Exercise; Aerobic exercise (training) involves large muscle groups in dynamic activities that result in substantial increases in heart rate and energy expenditure. Regular participation results in improvements in the function of the cardiovascular system and the skeletal muscles, leading to an increase in endurance performance. It is any physical activity that makes you sweat, causes you to breathe harder, and gets your heart beating faster than at rest. It strengthens your heart and lungs and trains your cardiovascular system to manage and deliver oxygen more quickly and efficiently throughout your body. Aerobic exercise uses your large muscle groups, is rhythmic in nature, and can be maintained continuously for at least 10 minutes (Howley, 2001).

Combined Training; is one method that many coaches employ as it consists of training multiple qualities at equal amounts of focus within the same training phase and often within the same workout (Fyfe *et al*., 2014).

Health related fitness; involves exercise activities that you do in order to try to improve your physical health and stay healthy, particularly in the categories of cardiovascular endurance, muscular strength , flexibility ,muscular endurance and body composition.

Resistance Exercise; Resistance training is a term that implies the use of load, machinery, or own body weight while exercising the muscles. It's used to increase the ability to overcome load and increase muscle mass. Any exercise where you move your body against resistance can be considered resistance or strength training. It is any force that makes the movement harder to perform. Resistance can be provided simply by moving your body against gravity or by adding weighted dumbbells. You can also add resistance by using machines at the gym or by using equipment such as weighted bars, bands, or kettle bells(Shaw *et al*., 2015).

2. REVIEW OF RELATED LITERATURE

2.1. Combined Training

The arrangement of combining strength and endurance training within the same training cycle is called combined training (Fyfe *et al*., 2014). Combined training (CT) is a model of exercise prescription that combines strength training and aerobic capacity in the same period of time and that has been extensively investigated in recent years (Hakkinen *et al*., 2003).Many investigation prove that regular aerobic training program is helpful for an increment in WBC count in human blood and aerobic training program is beneficial for the positive change in hemoglobin level and Rbc (Red blood cells) count in human blood (Singh, 2017; Yeshbeer,2017). Eight weeks of experimental treatment significantly influence on erythrocytes content in college students. However, there was no significant difference between experimental groups (Umarani and Shelvam, 2015).

2.2. The Effect of Exercise Training on Red Blood Cell

Training increases total hemoglobin mass by stimulating erythropoiesis, which increases the amount of O_2 that can be carried by blood. It also increases red blood cell which increases the sensitivity of Hgb-O_2 affinity to acidification dependent O_2-release.The system appears to be optimized for exercise at low altitude, because in an hypoxic environment the decreased arterial PO_2, which is the major determinant for O_2 diffusion, cannot be compensated adequately by the above mentioned O_2 transport mechanisms resulting in a decrease in performance with increasing degree of hypoxia (Heimo, 2013).

The purpose of this study is to investigate the effect of aerobic and strength exercises on hematological parameters in sedentary women. To achieve the purpose of this study, a total of 23 volunteers including aerobic exercise group (AE, n: 10), strength exercise group (SE, n:13) were selected as participants. Two different exercises were applied for 4 days a week, throughout 16 weeks, within 60 minutes for each exercise with the intensity of heart rate (HR) 60-70 percent. The HR was measured using a heart rate monitor for each subject. The women's white blood cell (WBC), thrombocyte (PLT), red blood cell (RBC), hemoglobin (HGB), hematocrit (HCT) and mean corpuscular volume (MCV) were measured before and after

exercise. For statistical analysis, the Wilcoxon signed-rank test was used for intra-group evaluations, and the Mann Whitney U test was used for inter-group evaluations. After the exercise program, there were a meaningful decrease in the body weight and body mass index (BMI) the women in both intervention groups. In addition, in the hematological results of strength exercise group, some meaningful decreases were determined in the values of RBC, HGB, HCT and MCV.As a results, it was observed that regular aerobic and strength exercises can positively influence the body weight and BMI parameters of sedentary women. Along with this, a meaningful decrease has been found in the values of RBC, HGB, HCT and MCV of strength exercise group compared to aerobic exercise (Munn et al; 2005).

Aerobic exercise training (AET) is known to increase RBC production; however, this has not been evaluated in breast cancer patients undergoing adjuvant chemotherapy. The purpose of this study was to examine the changes in hemoglobin (Hb) levels in the Supervised Trial of Aerobic versus Resistance Training (START) and to determine its association with changes in VO2peak. Two hundred and forty-two breast cancer patients initiating chemotherapy were randomized to usual care (n = 82), resistance exercise (RET, n = 82), or AET (n = 78) groups for the duration of their chemotherapy (median, 17 weeks). Supervised exercise was thrice weekly based on standard AET and RET prescriptions.

Aerobic fitness (VO2peak) and Hgb concentration were measured at baseline and end of chemotherapy. Regardless of the exercise group, Hgb declined over the course of chemotherapy (13.4 ± 10.0 to 11.8 ± 11.5 g/dL, $P < 0.01$). Both AET and RET groups had significant, moderate correlations between the change in VO2peak and Hgb (AET: $r = 0.49$, $P < 0.001$; RET: $r = 0.39$, $P = 0.001$). The results indicate that regular exercise does not protect against the decline in Hgb associated with chemotherapy in breast cancer patients, but resulted in a stronger association between Hgb and VO_2 peak(Dolan et al;2010.)

The aim of this research is finding the effect of one period of training on hemoglobin, hematocrit, RBC of athlete girls. . In this research effect of eight weeks aerobic training which including 40 minute running twice a week with 60 to 65 percent reserve heart rate on HB, HCT & RBC wereexamined.13 athlete girls were selected none randomly. The samples did not have any disease. They were not smokers. The samples are asked that they go to the laboratory in 9 clocks at morning for performing blood examination. Getting blood sampling was performed in

seventh day of girl s follicular period. Training was eight weeks& twice on each week. Each session were 40minutes running with 60 to 65 percent of reserve heart impulse for girls. Automatic machines for measuring of hemoglobin, hematocrit & RBC were used. Raw information was considered by using of descriptive statistics methods which conclude of tables, means & standard deviation. Also deduction statistic method which was concluded student of associate groups was considered. For refusing or accepting of hypothesis level (< %5 or = %5) was considered & SPSS was used. It was seen significant decrease in HB, HCT, and RBC in athlete girls(Arifin *et al.,20 11*).

2.3. The Effect of Exercise Training on Hemoglobin

The effect of endurance sports on selected hematological parameters of sports person mean age, height and weight of sports person and sedentary individuals. The mean age of control subjects was 29.80 ± 2.70 years while that of sports persons 27.7 ± 4.93 years. The mean weight was 62.00 ± 7.63 kg and 60.90 ± 5.98 kg in control and sports persons respectively. Similarly the mean height was 167.47 ± 5.61 cm and 168.40 ± 4.32 cm in control and sports persons respectively. The mean Hemoglobin level was lower in sports person (14.10 ± 0.60 gm %) and higher in control subjects (14.73 ± 0.77 gm %). Similarly the RBC count also shows difference i.e. sports persons (4.91 ± 0.33 million per cm) and higher count in control subjects (5.68 ± 0.47 million per cm). The differences were significant. The findings of the study revealed lower Red blood cell count and Hemoglobin content in sportspersons than the sedentary group. This study conclude that endurance sports disciplines and exercises over a longer duration tends to reduce the hemoglobin and red blood cell count in human beings to an extent which is more of beneficial than detrimental to the body (Saurin *et al* .,2012).

Study was conducted at institutions' of Acharya Nagarjuna University area were considered as population for the study, representative sample of 60 college students in the age of 18-22 years was chosen as sample for the study. The selected participants were divided into four groups. The group I underwent aerobic training, group II underwent resistance training, group III underwent concurrent training and group IV act as a control group. The experimental groups underwent eight weeks of training in their particular workout .

The results of the study proved that there were significant differences between the control group and aerobic training, resistance training and concurrent training group. The eight weeks of experimental treatment significantly influence on the hemoglobin content in college students. However, there was no significant difference between experimental groups (Bhasha and Kishore, 2014).

The effect of 8-week Yogic practices on hematological variables and lipid profile of university level sports persons shows that the numbers of red blood cells has significantly improved in experimental group pretest value (4.46 x 10^{12}/L) and posttest value (4.59 x 10^{12}/L) after 8 week yogic training ($P<0.05$) (La, 2015). Therefore those studies show that there is no consistent result and the combined study is not conducted yet, as a result further study is needed.

2.3. The Effects of Exercise Training on Platelet

In a study investigate on the effects of high-intensity interval and concurrent (aerobic-resistance) long-term sport training on the blood fibrinolysis and coagulation parameters in healthy non athlete young persons. In this semi-experimental study, 30 healthy non-athlete young men were studied in Saqez in 2014. After the training intervention, the number of platelets and the fibrinogen level significantly decreased in concurrent group (Sobhanix *et al*., 2016; Cengiz, and Çinar, 2014; Garai *et al.,* 2017).

A large body of evidence indicates that both acute exercise and habitual physical activity affect platelet function. This is of special interest as the inflammatory and immune modulatory consequences of platelet activation are increasingly recognized and platelets therefore seem to be of central importance not only to the final stages of cardiovascular disease (CVD), but also to the development of these diseases. Therefore, a modulation of platelet function by acute exercise and/or habitual physical activity might represent a mechanistic link between physical exertion and its observed effects on CVD. This would be especially interesting as a remarkable strong correlation exists between CVD-related mortality and physical activity, as we will discuss later in this review.

In order to give a structured overview based on currently available literature, the first part of this review will deal with the influence of acute (mostly strenuous) exercise on platelet function. To introduce the reader to different aspects of platelet activation as well as platelet function tests (and also as interpretation of obtained results may critically depend on the applied methodologies), this will be done from a platelet-centered view where different aspects of platelet activation are treated separately. Subsequently, the impact of exercise intensity and the subjects' cardiorespiratory fitness on the effects of exercise on platelet function is summarized and discussed, including the modulating effects of cardiorespiratory fitness/physical activity on platelet function in the resting state.

As platelet activation is closely related to the liberation of growth factors and inflammatory mediators, platelets play a central role in the development of CVD. Virtually all cardiovascular risk factors favor platelet hyper reactivity and, accordingly, also physical (in)activity affects platelet function. Within this paper, we will summarize and discuss the current knowledge on the impact of acute and habitual exercise on platelet function. Although there are apparent discrepancies regarding the reported effects of acute, strenuous exercise on platelet activation, a deeper analysis of the available literature reveals that the applied exercise intensity and the subjects' cardiorespiratory fitness represent critical determinants for the observed effects.

Consideration of these factors leads to the summary that (i) acute, strenuous exercise can lead to platelet activation, (ii) regular physical activity and/or physical fitness diminish or prevent platelet activation in response to acute exercise, and (iii) habitual physical activity and/or physical fitness also favorably modulate platelet function at physical rest. Notably, these effects of exercise on platelet function show obvious similarities to the well-recognized relation between exercise and the risk for cardiovascular events where vigorous exercise transiently increases the risk for myocardial infarction and a physically active lifestyle dramatically reduces cardiovascular mortality(Heber and Volf, 2015).

2.4. The Effects of Exercise Training on White Blood Cell

The effects of a circuit resistance training session with a light intensity on some hematological parameters of 20 male students of Physical Education voluntarily participated in a study. After equalization, they were randomly divided into two groups including light-intensity exercise

(35% of a maximum repetition) and no exercise (the control). Persons in the first group were asked to perform 10-step circuit exercise for three non-stop alternating rounds with a rest period at each round. Hematological parameters measured included white blood cells, platelet variables, and red blood cells. Results showed that none of the variables related to white blood cells and platelet had a significant change in the group of light-intensity exercise (35% of a maximum repetition) and only mean corpuscular volume (MCV), among the variables related to red blood cells, decreased significantly. In the control group, a significant increase in neutrophil percent (NEUT) and hemoglobin and a significant decrease in lymphocyte percent (LYM) were observed. In addition, there was no difference between the groups (Niaki and Tayebi, 2013).

The was to examine the effects of resistance training on hematological blood markers in older individuals. Twenty-nine men and women participated to this study. Subjects were randomized in 2 groups: (1) control () and (2) resistance training (). At baseline and after the intervention, subjects were submitted to a blood sample to determine their hematological profile (red blood cells, hemoglobin, hematocrit, platelets, leukocytes, neutrophils, lymphocytes, monocytes, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, red cell distribution width). At baseline, no difference was observed between groups. Moreover, we found no significant difference after the intervention on any of these markers. A 6-month resistance program in healthy older individuals seems to have no beneficial nor deleterious effects on hematological blood parameters. However, resistance training was well tolerated and should be recommended for other health purposes. Further studies are needed to confirm these results in a large population(Bobeuf *et al* ; *2009*.)

The study was conducted to scrutinize the effect of aerobic training program on white blood cell count. For achieving the purpose of the study data was collected on twenty male students between age group of 18- 23 years from National College of Physical Education Chupki, Patiala. The subjects were allocated into two groups: Group-A: Experimental (N1=10) and Group-B: Control (N2=10). Before and after exercise protocol, the Wbc count was measured. The experimental group was subjected to an aerobic training program, consisting of five days per week evening session for the period of six - weeks. To compare the effect of aerobic training program on white blood cell count mean, standard deviation and t-test were employed

with the help of statistical package of SPSS. Result showed that there was significant increment on Wbc count of only in experimental group (Ranbir, 2017).

Effect of aerobic training, resistance training and concurrent training on erythrocytes of sixty college boys age18 to 22 years were selected as subjects who were from the Sri Renganathar Institute of Engineering and Technology, Coimbatore. They were divided into four equal groups of fifteen each, Group I underwent aerobic training, Group II underwent resistance training, Group III underwent concurrent training and Group IV acted as control that did not participate in any special training apart from their regular curricular activities. The subjects were tested on selected criterion variable such as erythrocytes prior to and immediately after the training period through laboratory tests. The eight weeks of experimental treatment significantly influence on erythrocytes content in college students. However, there were no significant differences between experimental groups (Umarani and Shelvam, 2015).

High-intensity exercise causes tissue damage, production of stress hormones, and alterations in the function and quantity of various immune cells. Many clinical-physical stressors such as surgery, trauma, burns and sepsis induce a pattern of hormonal and immunological response similar to that of exercise. It has thus been suggested that heavy exercise might be used to cause graded and well-defined amounts of muscle trauma, thereby serving as an experimental model for inflammation and sepsis. In order to explore whether some form of strenuous exercise might provide an useful model for the inflammatory process, we studied the effects of three different exercise protocols on blood leukocyte count during and following exercise. Four different experimental conditions, using a randomized-block design.

Defense and Civil Institute of Environmental Medicine, North York, Ontario, Canada. Eight healthy and moderately fit males. Participants were each assigned to four experimental conditions. Subjects performed 5 minutes of cycle-ergometry exercise at 90%, 2 hours of cycle-ergometry exercise at 60%, a standard circuit of resistance exercises with 3 sets of 10 repetitions at 60 to 70% of one-repetition maximum (1- RM) force at each of 5 different stations; or they remained seated for 5 hours. Flow cytometric analysis. Blood samples were analyzed for total leukocyte counts, total T cells, T helper/inducer cells, T suppressor/cytotoxic cells, B cells, cytolytic T cells, and natural killer cells. The peak aerobic and prolonged sub

maximal exercise induced similar alterations in cell counts. These changes were generally larger than those produced by the resistance exercise, although both resistance and peak aerobic exercise resulted in a significantly longer-lasting decrease in the CD4+ / CD8+ ratio than the sub maximal exercise bout did. The data suggest that, of the three exercise patterns tested, prolonged aerobic exercise induced the largest and most readily measured patterns of immune response. Nevertheless, the changes provided only a partial model for the clinical inflammatory process(Natal *et al*; 2003).

2.6. The Effects of Exercise Training on Health Related Fitness

Concurrent resistance and endurance training was conducted on body composition, aerobic power and muscular endurance in college students and compared the two concurrent exercise protocols. Forty-two male students (22.02±1.91 years of age) were divided into three groups: Concurrent Distinct Endurance-Resistance (CDER), Concurrent Parallel Endurance-Resistance (CPER) and No Training controls (C). The subjects performed two training protocols per week for 12 weeks. In CDER group, resistance training and endurance training were performed on different days each week (two and two days per week). CPER group performed endurance and resistance training on the same days each week (two days per week).

After a 12-week training period, fat-free mass, muscular strength [weight lifted in squat and bench press (kg)], muscular endurance [pull-ups and sit-ups (numbers)], aerobic power, flexibility and Sargent jump height increased similarly in both experimental groups (CDER and CPER). Also, decreases in body fat percentage, mean time in 60 m running and agility occurred in CDER and CPER. A significant difference in body fat percentage was seen in CPER when compared to CDER and C. Body mass increased significantly in CPER when compared to CDER and C. Although body mass increased only after the CPER protocol application, it can be concluded that both CDER and CPER protocols were similarly effective in positive transformation of body composition, aerobic power and muscular endurance (Arazi *et al*., 2011).

The purpose of this study was to determine (a) the effects of strength training (ST) on physical function and (b) the influence of strength, power, muscle volume (MV), and body composition on physical function. Healthy, inactive adults (n = 50) aged 65 years and older underwent

strength, power, total body composition (% fat and fat free mass [FFM]), and physical function testing before and after 22 weeks of ST. Physical function testing consisted of tasks designed to mimic common physical activities of daily living (ADL). To improve internal validity of the assessment of mid-thigh inter muscular fat, subcutaneous fat, and knee extensors MV, a 10-week unilateral ST program using the untrained leg as an internal control preceded 12 weeks of whole-body ST. Strength, power, and FFM increased significantly with ST (all $p < 0.05$), whereas rapid walk, 5 chair stands, and get up and go time decreased significantly with ST in the overall group (all $p < 0.05$). Women improved significantly in both walking test times (both $p < 0.05$) but not in the stair climb test, whereas men improved in the stair climb test ($p < 0.05$) but not in walking test times. Multiple regression analysis revealed the highest R^2 (0.28) for the change in chair stands time, followed by stair climb and usual walk at 0.27 and 0.21, respectively. ST improves performance in functional tasks important for ADLs. Changes in strength, power, and FFM are predictors of ST-induced improvements in these tasks(Hanson *et al.*, 2009).

Strength training or aerobic exercise programmers might optimize muscle and cardio respiratory function and prevent additional disuse atrophy and deconditioning in people with a muscle disease. This is an update of a review first published in 2004. Objectives: To examine the safety and efficacy of strength training and aerobic exercise training in people with a muscle disease. Search methods: We searched the Cochrane Neuromuscular Disease Group Specialized Register (July 2012), CENTRAL (2012 Issue 3 of 4), MEDLINE (January 1946 to July 2012), EMBASE (January 1974 to July 2012), EMBASE Classic (1947 to 1973) and CINAHL (January 1982 to July 2012).

Randomized or quasi-randomized controlled trials comparing strength training or aerobic exercise programmes, or both, to no training, and lasting at least six weeks, in people with a well-described diagnosis of a muscle disease. We did not use the reporting of specific outcomes as a study selection criterion. Data collection and analysis: Two authors independently assessed trial quality and extracted the data obtained from the full text-articles and from the original investigators. We collected adverse event data from included studies. Main results: We included five trials (170 participants). The first trial compared the effect of strength training versus no training in 36 people with myotonic dystrophy.

The second trial compared aerobic exercise training versus no training in 14 people with polymyositis and dermatomyositis. The third trial compared strength training versus no training in a factorial trial that also compared albuterol with placebo, in 65 people with facioscapulohumeral muscular dystrophy (FSHD). The fourth trial compared combined strength training and aerobic exercise versus no training in 18 people with mitochondrial myopathy. The fifth trial compared combined strength training and aerobic exercise versus no training in 35 people with myotonic dystrophy type 1.In both myotonic dystrophy trials and the dermatomyositis and polymyositis trial there were no significant differences between training and non-training groups for primary and secondary outcome measures.

The risk of bias of the strength training trial in myotonic dystrophy and the aerobic exercise trial in polymyositis and dermatomyositis was judged as uncertain, and for the combined strength training and aerobic exercise trial, the risk of bias was judged as adequate. In the FSHD trial, for which the risk of bias was judged as adequate, a +1.17 kg difference (95% confidence interval (CI) 0.18 to 2.16) in dynamic strength of elbow flexors in favour of the training group reached statistical significance. In the mitochondrial myopathy trial, there were no significant differences in dynamic strength measures between training and non-training groups. Exercise duration and distance cycled in a sub maximal endurance test increased significantly in the training group compared to the control group.

The differences in mean time and mean distance cycled till exhaustion between groups were 23.70 min (95% CI 2.63 to 44.77) and 9.70 km (95% CI 1.51 to 17.89), respectively. The risk of bias was judged as uncertain. In all trials, no adverse events were reported. Authors' conclusions: Moderate-intensity strength training in myotonic dystrophy and FSHD and aerobic exercise training in dermatomyositis and polymyositis and myotonic dystrophy type I appear to do no harm, but there is insufficient evidence to conclude that they offer benefit. In mitochondrial myopathy, aerobic exercise combined with strength training appears to be safe and may be effective in increasing submaximal endurance capacity. Limitations in the design of studies in other muscle diseases prevent more general conclusions in these disorders(Voet *et al* .,2013).

2.6.1. Effect of resistance training on flexibility in young adult men and women

Flexibility is important for postural stability and balance with low levels of flexibility possibly increase the risk of osteoarticular injury, back pain, and difficult performing activities of daily life . Stretching exercises are recommended for the maintenance and/or doing (RT), in addition to muscular strength and body composition benefits, has been shown as a viable alternative for increasing flexibility in various populations . Changes induced by RT on muscle architecture, density of myofilaments, and structure of connective tissue, may improve flexibility by a reduction in passive tension and stiffness of the tissues surrounding a joint. Thus RT may be a time saving strategy to increase flexibility and so may aid adherence to an intervention program among some populations.

In fact there is evidence that regular RT serves as an active form of flexibility training and can improve range of motion to a similar extent as typical static stretching protocols. As expected, men had greater mass and were taller compared to women (P <0.05).Changes in skeletal muscle mass and flexibility at the different time points of the study are presented. There was no group (sex) by time interaction(P >0.05) for any of the outcomes analyzed. A significant main effect of time (P <0.05) was observed for skeletal muscle mass, shoulder extension, shoulder flexion, hip flexion, frontal hip flexion, and lateral trunk inclination. Both sexes presented a similar magnitude of increase in skeletal muscle mass from pre- to mid-training (+1.2%) and from mid- to post-training(+0.8%).

Both sexes increased similarly in flexibility from baseline to mid-training in shoulder extension(10.4–11.1%) and lateral trunk inclination (2.4–3.4%).Hip flexion and trunk flexion also increased similarly in men and women from baseline to mid-training (hip flexion = 3.7–3.9%, trunk flexion = 2.7%), however, decrease toward baseline was observed from mid to post-training (hip flexion = -2.4 – -2.6%, trunk flexion = -1.4%) without a difference between sexes. While shoulder flexion increased similarly in men and women from baseline to post-training (1.3–2.8%).Both sexes showed significant increases in 1RMscores for BP (men = +20.8%; women = +29.2%),SQ (men = +12.7%; women = +16.1%), and AC(men = +15.3%; women = +20.8%) with no statistical significant difference between sexes. The results observed in this study suggest that RT improves or at least preserves the flexibility of different joint movements in young adult men and women(Ribeiro *et al.,* 2017).

3. MATERIALS AND METHODS

3.1. Study Area and Period

The research was conducted in Haramaya University main campus. Haramaya University, established in 1954, is one of the oldest universities in Ethiopia. Geographically the study area is located approximately 505 km east of Addis Ababa, 5 km away from Alemaya town in the east Hararghe Zone, about 23 km from the city of Harar and 40 km from Dire Dawa. It is found in east Hararghe Zone, and it has 42° 01' 60.00" E longitudinal and 9° 25' 17.99" N latitudinal coordinates and 1950 meters above sea level. The area receives a bimodal rainfall, long rainy season (July to September) and short rainy season (March to June). This experimental study was conducted for 12 weeks of combined exercise training from December to February 2019.The University has many recreational areas and equipped with facilities like swimming pool, gymnasium, three in one courts, and soccer stadium which allows to conducts The research was conducted in the main gymnasium

3.2. Study Design

The study was followed a repeated-measuring of single group of pre and post experimental design.

3.3. Source of Population

The source of this study was Haramaya University 2018/2019 regular program students.

3.4. Study Population

The study population was selected as per inclusion and exclusion criteria from Haramaya university sport science academy first year male students who are moderately active and healthy. Those apparently healthy Haramaya university sport science students were identified for this study following announcements that was posted as well as by communicating with sport science academy staffs. Subjects were moderately active as characterized by irregular walking, cycling or occasional team sports at light to moderate intensity. Subjects not engaging in systematic or structured endurance or strength training of 6

months prior to the study were identified. The subjects were limited to age of 19 -22 years due to the fact that growth and maturation affects most body systems in the chronological ages below 19 (Beunen and Malina, 2008). Besides, the subjects was limited to only male subjects so as to keep the homogeneity and avoid confounding errors. On top of that the physiological and biochemical phenomenon of the menstrual cycle makes the measurement biased since different biomarkers vary in the different times of the menstrual cycle (Mittleman and Zacher, 2000; Frankovich and Lebrun, 2000)

3.5. Exclusion and Inclusion Criteria

3.5.1. Inclusion criteria

Inclusion criteria includes, none athlete, not taking part in planned exercise regularly screened by international physical activity questionnaire (IPAQ), should have not done prior to the start of the study, age between 19 - 22, BMI 20 - 29, living in the campus, non- smoker, not on medication. The untrained healthy participants was screened using physical activity readiness questionnaire (PAR-Q), and clinical examination by a health professional for chronic problems in order to be included in the study.

3.5.2. Exclusion criteria

The exclusion criteria of this study was female athletes, have chronic diseases such as cardiovascular, pulmonary, and orthopedic disorders, age below 19 years and above 24 years old , and living outside the campus.

3.6. Sample Size Determination

3.6.1. Sample Size

The total subjects included in this study were 45 (forty five). Previous studies conducted of similar exercise intervention, 20 (twenty) individuals were assigned for the exercise (Bartlett *et al.*, 2016).

3.6.2. Sampling Technique

Haramaya university main campus was selected purposively as study area. The subjects were selected purposively 45 students from total of 76 1st year male sports science students. Those Haramaya university sport science students in the identified campus were screened as per the inclusion and exclusion criteria.

3.7. Variable Selection

3.7.1. Independent Variable

The independent variable of this study was 12 weeks of combined aerobic and resistance exercise training. The 12 weeks' exercise intervention was selected on the basis of minimum threshold for adaptation in most variables (park *et al*., 2003).

3.7.2. Dependent Variable

The dependent variables of the study were white blood cell, red blood cell, hemoglobin, hematocrit, platelet number and some health related fitness (flexibility, strength endurance).

3.8. Exercise procedures

The study participants was done the combined aerobics and resistance exercise three times per week for 12 weeks as per exercise protocol which is indicated in the appendix.

3.9. Data Collection methods

Measurements were obtained at two times during the intervention period; 2 days before the 12 weeks of combined training, and 2 days after the last session of the end 12 weeks of combined training intervention period. The blood was collected by two professional laboratory technicians from Haramaya university higher clinics. All measurements were taken at the same time of day. Such a protocol of measurement was also employed by a study conducted on effect of aerobic training resistance training and concurrent training. All measurements was conducted at the same time of day (Bhasha and Kishore, 2014; park *et al.,* 2003).

3.9.1. Health Related Fitness Measurement

a. Sit and Reach Test

This test measures the flexibility of the lower back and hamstring muscle. This test involves sitting on the floor with legs out straight ahead. Feet (shoes off) were placed with the soles flat against the box, shoulder width apart. Both knees were held flat against the floor by the tester with hands on top of each other and palms facing dawn, the subject was reach forward along the measuring line as far as possible. After three practice reaches, the fourth reach were held at least two seconds while the distance is recorded. Make sure there is no jerky movement and that the fingertips remain level and the legs flat. The score was recorded to the nearest centimeter at the distance before (negative) or beyond (positive) the toes. The procedures for the present challenge require that the box is made with 23 centimeters at the level of the feet, so 10 centimeters past the toes will be recorded as positive centimeters(ACSM, 2008).

b. Push- Up Test

This test was conducted using floor mat, metronome (or audio tape, clamping, drums). The subject was in push up position with the hands and toes touching the floor, the body and legs are in straight line, feet slightly apart, and the arms at shoulder width apart, extended and at a right angle to the body. Keeping the back and knees straight, the subject will lower the body until there is 90-dgree angle at the elbow, with the upper arms parallel to the floor. A partner holds their hand at the point of the 90-degree angle so that the subject being tested goes dawn only until their shoulder touches partner's hand, then back up. The push up was done in time to a metronome or similar device with one complete pushup every three seconds. The subject was continue until they can do more in rhythm (has not done the last three in rhythm).the number of correctly completed pushups that were performed in rhythm was recorded (ACSM, 2008).

3.9.2. Laboratory Protocol for Complete Blood Count Test

All instrumental calibration was made according to factory guidelines.

Complete Blood Cell Count

To measure complete blood count (CBC), 5 ml of venous blood taken and poured into EDTA tube and quickly transferred to the laboratory in 30 minutes. Selected hematological components (WBC count, RBC, Hgb, Hct and Platelet cell) were measured within 6 hours at standard room temperature (25℃) by clinical instrument called HUMACOUNT at Haramaya University Higher Health clinic Center. The two laboratory technician were manipulated all the experiment under the safety procedures of the instrument. The HUMACOUNT instrument is capable to analyses 30 samples per hour.

3.10. Reliability of the Tests and Instruments

The test was made by professionals of two laboratory technicians in the higher health clinic. The test reliability was maintained in each test and errors were minimized.

3.11. Statistical Analysis

Descriptive statics was used to summarize the study variables as well as describe the demographic characteristics. Here mean, standard deviation, were computed for the selected variables. Paired sample students t - test was used to test the null hypothesis for significant difference as a result of 12 weeks of combined aerobic and strength training on the selected hematological parameters and on the health related fitness components. For the presence of significant difference post hoc test was computed using the Tukey's test for pair wise comparison (Verma, 2016). The hypothesis formulated was tested atα value 5% (0.05) for all variables to be studied in the study. Statistical analyses were carriedout using SPSS software version 20.0.

3.12. Data Quality Control

The test administrators should be those professionally trained in the respective professions ;fitness test was administered by two well experienced sport science professionals ,whereas the rest variables were tested by well experienced laboratory technicians with bachelor degree for estimations of the metabolic marker using HUMMACOUNT instrument and one clinical

nurse with bachelors' degree for collection of blood. The same test administrators for each test were used in each variable during the two test periods so that errors were minimized.

3.13. Ethical Consideration

Firstly the study was evaluated by Haramaya University Ethical Committee of human studies for approval. Then volunteers who satisfy the eligibility criteria (exclusion/inclusion criteria) were informed about the purpose of the study, risks and remedies. Those eligible volunteers were gave signed informed consent which is shown in appendix in accordance with the procedures.

4. RESULTS AND DISSCUSSION

4.1. Characteristics of study participants and dependent variables

Table 1: Characteristics of the study participants

Group	N	Age		Height		Weight	
		Mean	**S.D**	**Mean**	**S.D**	**Mean**	**S.D**
Experimental	45	20.38	0.81	173.72	5.17	60.88	6.5

N=number of participants /subjects, S.D. =Standard deviation,

As shown from above table1 descriptive characteristics of 45 study participants from Haramaya university sport science academy 1st year sport science mean age (20.38±0.81), height (173.72±5.17) and (60.88±6.5). This showed that the participants had relatively the same age, height and weight.

Table 2: Dependent Variables and Tests

No	Variables	Methods /Tests	Equipment	Units of Measurement
1	WBC	CBC(complete blood count)	Hummacount	10^3 cells/µL
2	RBC	CBC(complete blood count)	Hummacount	10^6cells/µL
3	Hgb	CBC(complete blood count)	Hummacount	g/dL
4	Hct	CBC(complete blood count)	Hummacount	%
5	Platelet	CBC(complete blood count)	Hummacount	10^3 cells/µL
6	Strength endurance	Push up test	Measuring tape, laptop, Mat(flat floor)	Repetition per minute
7	Flexibility test	Sit and reach test	Stepper, ruler, plaster	Centimeter

WBC =white blood cell, RBC=red blood cell, Hgb=hemoglobin, Hct=hematocrit, CBC=complete blood count, g/dL=gram per micro liter, 10^3 cells/µL=1,000 cells per micro liter,10^6cells/µL=1,000,000 cells per micro liter.

As it can be seen the above table 2 illustrated that the types of variables, methods/test items and their measurement units which designed to do this experimental research. The result of selected hematological parameters and selected health related fitness components variables of experimental subjects pre and post test data were analyzed. Its results had showed here under.

4.2. The effects of combined aerobic and resistance exercise on Wbc

Table 3: The mean values of Wbc count pre training and post training test result

Variable	N	PT(X±SD)	PoT(X±SD)	MD	P-value
WBC **(**10^3cells/µL)	45	8.18±2.15	6.26±1.96	-1.81	0.000

N =number of subjects, PT = pre training, POT = post training, SD = standard deviation, WBC = white blood cell

Table 3 shows that combined aerobics and resistance exercisechanges the white blood cell count of Haramaya university sport science academy1st year male sport science students. The mean values of the subjects(N=45) before training was found to be 8.18×10^3/µL±2.15cells/µLand the mean value after 12 weeks training were 6.23×10^3±1.96 cells/µLand mean difference was 1.91×10^3/µL. The result showed that combined aerobics and resistance exercise decreases their Wbc count.

As shown in the table above the pre and posttest complete blood count of white blood cell test was a mean score of 8.18×10^3/µL±2.15 cells/µLand 6.23×103 ±1.96 cells/µL respectively. From this the investigator compute pre and post mean difference of the subjects complete blood count of white blood cell and the test was significantly improved by a mean difference of 1.91 at $p < 0.05$ (0.000) after three month of combined aerobics and resistance exercise training. There was decrease and satisfied significance change on complete blood count on the subjects. The implication is therefore combined aerobics and resistance exercise had an effect on white blood cell count as pretest compared with post test results .The present study showed that long term combined aerobics and resistance exercise has been decreased the complete blood count of white blood cell.

Effect of six - week aerobic training program on twenty male students age (18- 22 years) from national college of physical education Chupki, Patiala, on white blood cell count was conducted by Singh, (2017) and Bhatti, (2007). After three month of consecutive training the Wbc count increased significantly from mean value of 6.98 ± 0.42 to mean value of 7.38 ± 0.39. This result showed that the six weeks of aerobics exercise training on college boys had increment result as opposed to the current result which showed the 12 weeks of combined aerobics and resistance exercise had a significant decrease on Haramaya university 1st year male students. Based on the present study the null hypothesis has been rejected and the alternate hypothesis has been accepted.

4.3. Effects of Combined Aerobics and Resistance Exercise on Rbc, Hgb and Hct Cell

Table 4:The mean values of Rbc, Hgb and Hct test for EG

Variable	N	PT(X±SD)	PoT(X±SD)	MD	P-value
RBC(10^6cells/µL)	45	4.68±1.14	5.29±1.21	0.31	0.000
Hgb (g/dL**)**	45	15.46±1.04	16.23±0.92	0.77	0.000
Hct (%)	45	47.68 ±3.13	50.86 ±2.83	3.18	0.000

N =number of subjects, PT=Post test result, POT=Post test result, ΔX= mean difference, p=significant level, SD=standard deviation, RBC=red blood cell, EG= experimental group

As shown from table4 the average pretest score of the subjects red blood cell count (N=45) was 4.68 × 10^6 ±1.14 cells/µL; the post test result red blood cell mean was found to be 5.29×10^6 ±1.21cells/µL. The mean pretest of hemoglobin was 15.46± 1.04 g/dL, posttest mean hemoglobin was 16.23 ±0.92 g/dL, the pretest mean hematocrit was 47.8 ± 3.13%, the post mean value was found to be 50.86±2.83%**.**The above data showed that the 12 weeks of aerobics and resistance exercise has been recorded positive significance change (p= 0.000) the subjects.

The same study was conducted at Acharya Nagarjuna University, India on 15 male students' age from 18 to 22 years. After eight weeks of Concurrent aerobics and resistance training ,the mean value of hemoglobin increased from 14.79g/dL to 15.26g/dL(Bhasha and Kishore,

2015). This showed that long term concurrent aerobics and resistance positively increased hemoglobin significantly which had the same result on the present study.

Singh, (2017**)** studied the effect of eight - week aerobic training protocol on RBC Count and Hemoglobin level among judokas of Judo Federation of India (JFI) Training Center Gurdaspur, Punjab. The aerobics training was given for 5 days per week at evening section. After eight – weeks of aerobic training program the hemoglobin and Rbc level increased significantly from 3.97 g/Dl to 4.71g/dL, and 3.97to 4.71 in experimental group respectively.

On other study conducted in India by Sanghavi *et al*.,(2012)on sports persons age (20 – 35),concluded that endurance sports disciplines and exercises over a longer duration reduce the hemoglobin and red blood cell count in human beings .this finding was opposed the present study that combined aerobics and resistance exercise increased the hemoglobin level of Haramaya university sport science first year male students.

4.4. Effects of Combined Aerobics and Resistance Exercise on Platelet

Table 5: The means value of Platelet test results

Variable	N	PT(X±SD)	PoT(X±SD)	MD	P-value
Plt (10^3cells/µL**)**	45	391.8±61.83	460.38±61.38	68.58	0.000

*Plt =platelet, N=number of subjects, PT= pretest mean value, X= mean value, SD = standard deviation, POT=posttest, ΔX=mean value difference**,** p-value= significance difference*

As it can be seen in the above table 5 after 12 weeks of combined aerobic and resistance training the mean pretest value of the subjects (N=45) was found to be 391.8×10^3 ±61.83 cells/µL and the posttest mean of platelet was recorded 460.38 $\times10^3$ ±61.38 cells/µL.The above result showed that combined aerobics and resistance exercise training significantly (at $p< 0.05$) changed platelet count of the adults from 391.8×10^3 cells/µL to 460.38 $\times10^3$ cells/µL. After 12 weeks of continuous combined aerobics and resistance training at a moderate intensity, the platelet count of the subject was changed on average by 68.58($p < 0.05$).

A study was conducted on effect of time of day and exercise on platelet functions and platelet neutrophil aggregates in healthy male subjects(N=10), aged 27±1.63 by Aldemir, (2005).In this

study the effect of exercise and time of day were examined on platelet activity with platelet–neutrophil aggregates. Platelet count showed significant increase after morning exercise (236 ± 32) × 109 l^{-1}. This finding was investigated the acute effect and time of training effect as opposed to the present study that the chronic effects of combined aerobics and resistance exercise training though both result showed significance increment based this finding the null hypothesis was rejected and alternate hypothesis accepted.

4.5. Effects of Combined Aerobics and Resistance Exercise Training on Muscular Endurance

Table 6: The mean values of push up test

Variable	N	**PT**(X±SD)	**PoT**(X±SD)	**MD**	**P-value**
Push up(No. of reps)	45	22.93±9.54	27.27±8.11	4.33	0.000

N=number of subjects, No. reps=number of complete repetition, PT=pretest result, POT=post test results, X=mean value, ΔX=change in mean value, p- value= significance value.

As indicated in table5; after twelve weeks of combined aerobics and resistance exercise trainingon experimental subjects (N=45) the pretest and posttest push up means were found to be 22.93 ±9.54and 27.27 ±8.11 respectively. This study showed that combined aerobics and resistance exercise training changed strength endurance positively on the subjects by an average difference of 4.33 number of complete repetition at p-value less than 0.05(P=0.000).This investigation showed that combined aerobics and resistance exercise training improves the strength endurance of moderately active adult of Haramaya University first year male students.

This result was supported by Arazi *et al*., (2011) concurrent resistance and endurance training was conducted on body composition, aerobic power and muscular endurance in college students and compared the two concurrent exercise protocols. Forty-two male students (22.02±1.91 years of age) were divided into three groups: Concurrent Distinct Endurance-Resistance (CDER), Concurrent Parallel Endurance-Resistance (CPER) and No Training controls (C). The subjects performed two training protocols per week for 12 weeks. The finding was concluded that both CDER and CPER protocols were similarly effective in positive transformation of body

composition, aerobic power and muscular endurance. From this finding the null hypothesis was rejected and the alternate hypothesis has been accepted.

4.6. The Effects of combined aerobics and resistance Exercise Training on Flexibility

Table 7: The mean values of sit and reach test result of the subject

Variable	N	PT(X±SD)	PoT(X±SD)	MD	P-value
Sit and reach test (cm)	45	12.46±7.18	16.42±6.03	3.96	0.000

cm=centimeter, N=number of subjects, PT=pre sit and reach test result, POT=post sit and reach test results, X=mean value, ΔX=change in mean value, p- value= significance value.

As shown in table 7 the average pretest score of the experimental subjects (N=45) was found to be the mean value was 12.46 cm with standard deviation of 7.18 after twelve weeks combined aerobics and resistance exercise ; and the post average result were 16.42cm with standard deviation of 6.03. This showed that the twelve weeks of combined aerobics and resistance exercise training increase significantly P=0.00(< 0.05) the flexibility of Haramaya universitysport science students by 3.96 mean valuedifference. This finding showed that combined aerobic and resistance exercise has been helpful for better improvement of flexibility of adults.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

This study was to find out the effect combined aerobic and resistant exercise on selected hematological parameters and some health related fitness components of Haramaya University

first year sport science male students. The subjects were selected purposive random sampling method and the total population was 45- students (ages 18 to 22 years) and at the initial level subjects were screened to verify that weather they are fit or not to take part this study. Subjects were selected single experimental group only (n=45). These combined aerobic and resistant training programs were performed 3 days per week for 12 weeks. Before two days from the experimental session and two days after the end of 12^{th} week and all variables were assessed in laboratory complete blood count test for selected hematological parameters (Rbc, Wbc, Hgb, Hct, and platelet) using the instrument called Hummacount and field test for health related fitness components (strength endurance and flexibility) using 90 degree push up and sit and reach test respectively. The data collected through laboratory and field tests were thus, analyzed using paired sample T test. Data those collected from their age, weight and height variables measurements were analyzed through descriptive statistics (mean and standard deviation) and paired sample T test (mean difference, standard deviation mean and significance levels).

The experimental group of anthropometric variables were age 20.38 years $\pm$ 0.81, height 1.73.72 cm $\pm$ 5.17 and weight 60.88 kg$\pm$ 6.5 .The Experimental group pre and posttest mean result for selected hematological variables were (White blood cell pretest 8.18$\pm$2.15, posttest 6.26+1.96, Red blood cell pretest 4.98$\pm$1.14 and posttest 5.29$\pm$1.21, Hemoglobin pretest 15.45$\pm$1.04and posttest 16.23 $\pm$ 0.92,Hematocrit pretest 47.68$\pm$3.13 and posttest 50.86$\pm$2.83 ;and the selected health related fitness component; strength endurance pretest 22.93$\pm$9.54 with posttest mean value 27.27$\pm$8.11and Flexibility pretest 12.46$\pm$7.18 and post vale of 16.42 $\pm$6.03 mean and standard deviation respectively .The present study showed that Subject with combined aerobic and resistant training has significance effects on selected hematological parameters and health related fitness components variables (White blood cell, Red blood cell, Hemoglobin, Hematocrit, and muscular endurance, Flexibility respectively).

5.2. Conclusions

Based on the major finding

- The result of the study showed that the 12 consecutive weeks of combined aerobics and resistance exercise training had a negative effect on white blood cell count on moderately active adults.
- Combined aerobics and resistance exercise had positive significance change on red blood cell of the adults.
- The 12 weeks combined aerobics and resistance training has found positive result on hemoglobin level.
- Aerobics and resistance exercise training in combined way had positive significance change on hematocrit percentage on the subject.
- It was observed that the platelet count of the subject has been increased due to the 12 weeks of combined aerobics and resistance exercise.
- It was observed that there has been positive significance mean difference on the tests of strength endurance due to the twelve weeks consecutive combined aerobics and resistance exercise training on the subjects.

5.3.Recommendations

On the basis of the above results, discussion and conclusion the following recommendation was providing for proper implementation of combined aerobic and resistance exercise training program with regards to:

- Combined aerobics and resistance training should be incorporated in various training centers which solve the time constraint and get an effective change in health and wellness.
- Adult should be participated in regular combined training to increase strength endurance, flexibility and to stay themselves in healthy by improving complete blood count of hematological parameters.
- The researcher is interested to recommend that adults engaged regular physical fitness program that will help to improve their hematology parameters, to have good health and to increase their performance. But the sequence of aerobics and resistance type of training needs further investigation.
- It is quite clear that further research is necessary in the area of the effects of combined aerobics and resistance exercise training on hematological parameters and health related physical fitness components on different age level and sex.

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APPENDIX

APPENDEX- A

Table 1: Hematological Parameters of Test result

Paired Samples Statistics of hematology parameters					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post test result of Wbc	6.2620	45	1.96157	.29241
	Pre test result of Wbc	8.1764	45	2.14887	.32034
Pair 2	Posttest result of Rbc	5.2891	45	1.20822	.18011
	Pre test result of Rbc	4.9831	45	1.14200	.17024
Pair 3	Post test result of Hgb	16.2264	45	.92047	.13722
	Pre test result of Hgb	15.4536	45	1.03488	.15427
Pair 4	Post test result of Hct	50.8578	45	2.82429	.42102
	Pre test result of Hct	47.6747	45	3.13306	.46705
Pair 5	Post test result Plt	460.3778	45	61.31783	9.14072
	Pre test result of Plt	391.8000	45	61.83357	9.21761

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Post test Wbc & pretest Wbc	45	.380	.010
Pair 2	Post test Rbc & pre test Rbc	45	.951	.000
Pair 3	Post test Hgb & pre test Hgb	45	.305	.042
Pair 4	Post test Hct& pre test Hct	45	.130	.394
Pair 5	Post test Plt &pretestPlt	45	.562	.000

Paired Samples Test of hematological parameters

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Wbc	Post –pre test	-1.91444	2.29421	.34200	-2.60370	-1.22519	-5.598	44	.000
Rbc	post- pre test	.30600	.37399	.05575	.19364	.41836	5.489	44	.000
Hgb	post- pre test	.77289	1.15633	.17237	.42549	1.12029	4.484	44	.000
Hct	post- pre test	3.18311	3.93561	.58669	2.00072	4.36550	5.426	44	.000
Plt	post- pre test	68.57778	57.6074	8.58760	51.27060	85.88496	7.986	44	.000

CBC Reference Ranges (Males)

Parameter	1-5	6-18	19-65	66+
WBC (x 10^3µL)	4.3-14.1	3.7-11.9	3.9-12.1	3.9-12.3
RBC (x 10^6µL)	4.00 - 5.30	4.10-5.60	4.10-5.80	4.00-5.60
Hgb (g/dL)	10.5-13.7	11.5-16.3	12.7-17.1	11.0-16.8
HCT (%)	31.8-40.8	34.4-48.3	38.0-50.3	33.1-50.2
MCV (fL)	67.6-88.2	74.3-93.0	78.1-99.2	78.9-101.4
MCH (pg)	21.7-29.8	24.3-31.7	25.7-33.8	25.6-34.4
MCHC (g/dL)	31.5-35.0	31.9-35.1	32.0-35.3	31.8-35.1
RDW (%)	11.7-16.5	11.7-14.3	11.8-15.3	12.1-16.6
Plt (x 10^3µL)	224-568	194-477	157-414	138-407
MPV (fL)	6.3-9.3	6.6-9.9	6.8-10.4	6.7-10.6
LY (%)	24.5-70.0	20.0-56.6	17.8-51.8	13.0-48.3

Table 2: Hematology raw data

Code	**WBC (10^3 cells/µL)**		**RBC (10^6 cells/µL)**		**HGB (g/dL)**		**HCT (%)**		**PTC (10^3 cells/µL)**	
	Pre	Post	Pre	Post	Pre	Post	Pre	post	pre	Post

1	12.6	9.32	4.66	5.4	14.05	16	49.6	48.1	422	493
2	8.1	5.8	4.86	5.24	15.1	15.8	45	52.6	342	370
3	5.8	12.2	5.32	5.63	16.7	18.2	49.5	58.2	233	507
4	10.1	3.11	5. 41	5. 8	15.2	15.87	47.7	50.9	429	446
5	8.39	6.28	4.27	5.59	11.7	17.3	37.2	56.9	360	398
6	8.01	6.28	5.46	6.09	16.1	16.5	48.5	52.8	274	431
7	5	6.52	5. 36	5. 5	15.4	15.63	47.7	51.2	428	504
8	5.0	5.29	5.5	5.43	15.4	16.7	47.7	52.2	361	504
9	11.7	7.19	4.76	4.93	15.2	15.7	46.1	51.8	430	502
10	7.66	5.03	5.13	5.43	16.4	16.8	50.2	51.3	413	527
11	6.76	4.31	5.01	5.94	14.8	14.63	43.9	47.1	429	569
12	6.9	5.14	5.47	5.67	17.1	18.9	50.2	51.5	408	459
13	6.7	6.92	5.2	5.47	13.4	15.7	47.5	43.6	397	507
14	9.2	5.58	5.19	5.53	14.9	15.9	44.6	50.9	402	446
15	9.37	4.78	4.97	5.3	14.4	16.1	43.7	52.7	487	524
16	5.03	4.69	5.4	5.17	15.2	16.4	49	50.3	471	568
17	11.8	11.4	5.13	5.43	14.3	16.2	49.6	47.5	396	569
18	8.89	6.51	5.38	5.4	14.9	15.9	47.4	50.6	245	316
19	5.60	4.47	5.54	5.48	15.5	15.6	47	50.6	466	563
20	5.36	7.09	4.45	5.19	14.6	15.2	42.8	49.7	390	475
21	8.9	8.47	5.07	5.24	16.6	16.9	49.5	53.2	343	387
22	9.56	4.6	4.59	5.1	14.2	15.1	42.36	48.7	245	325
23	7.38	5.76	5.5	4.89	14.7	16.1	42.8	49.6	433	440
24	5.8	4.94	5.36	5.78	15.7	15.8	49.2	48.2	446	457
25	7.37	7.2	5.25	5.95	15.5	15.36	46	48.5	433	419
26	7.69	3.99	5.24	5.32	16	16.9	47.1	52.8	394	406
27	9.59	7.78	5.62	5.88	17	18	50.8	57.5	409	447
28	11	7.06	5.5	5.08	15.3	15.83	48.4	50.3	324	488
29	5.69	3.27	6.06	6.83	16.4	17.2	54.2	54.7	392	438
30	9.23	5.5	5.02	5.61	15.4	17.6	51	50.3	385	461
31	8.8	5.58	5.26	5.99	16.1	15.9	47.1	50.1	429	444
32	7.5	3.71	5.2	5.54	16	15.6	48	48.5	410	427
33	7.25	6.78	5.28	5.16	16.2	16.43	50.3	51.7	323	472
34	5.55	6.12	5.24	5.85	15.0	15.5	45.8	49.9	336	419
35	10.3	5.7	5.29	5.45	16	15.3	48.2	50.8	438	457
36	6.09	6.92	5.87	5.8	14.9	15.3	48.6	47.9	453	419
37	7.77	8.83	5.6	5.8	15.1	16.7	47.4	53.2	362	421
38	11.3	7.76	5.06	5.52	15	15.5	44.3	45.4	523	587
39	8.72	5.65	5.56	5.39	16.1	17.22	50	51.1	422	475
40	8.96	7.12	5	5.83	16.5	16.3	47.8	51.5	405	431
41	12.9	9.89	4.74	4.85	16	15.5	46.6	49.8	449	504
42	6.7	5.42	5.47	5.69	15.76	17.3	51.4	49.1	367	404
43	11	7.06	5.08	5.5	15.8	15.3	48.4	50.3	374	488
44	5.69	3.27	5.06	5.83	16.2	17.4	54.2	54.7	392	438
45	9.23	5.5	5.62	5.81	17.6	15.12	51	50.3	361	385

APPENDEX B

Table 3: Health Related Fitness Component

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Strength endurance	Posttest pushup	27.2667	45	8.11396	1.20956
	Pretest pushup	22.9333	45	9.54034	1.42219
Flexibility	Posttest sit and reach	16.4222	45	6.02453	.89808
	Pretest sit and reach	12.4644	45	7.18414	1.07095

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Posttest pushup	27.2667	45	8.11396	1.20956
	Pretest pushup	22.9333	45	9.54034	1.42219
Pair 2	Posttest sit and reach	16.4222	45	6.02453	.89808
	Pretest sit and reach	12.4644	45	7.18414	1.07095

Paired Samples Test									
		Paired Differences					T	df	Sig. (2-tailed)
Variable		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Strength endurance	Posttest push up–pretest pushup	4.33333	5.40202	.80529	2.71039	5.95628	5.381	44	.000
Flexibility	Posttest sit and reach–pretest sit and reach	3.95778	4.21564	.62843	2.69126	5.22430	6.298	44	.000

Table 4: Push Up Test norms for MEN

Age	**17-19**	**20-29**	**30-39**	**40-49**	**50-59**	**60-65**

Excellent	> 56	> 47	> 41	> 34	> 31	> 30
Good	47-56	39-47	34-41	28-34	25-31	24-30
Above average	35-46	30-39	25-33	21-28	18-24	17-23
Average	19-34	17-29	13-24	11-20	9-17	6-16
Below average	11-18	10-16	8-12	6-10	5-8	3-5
Poor	4-10	4-9	2-7	1-5	1-4	1-2
Very Poor	< 4	< 4	< 2	0	0	0

Source: adapted from Golding, et al. (1986). The Y's way to physical fitness (3rd ed.)

V Sit-and-Reach Test

Percentile rank	Age (Year) 18-25		26-35		36-45		46-55		56-65		>65	
	M	F	M	F	M	F	M	F	M	F	M	F
90	22	24	21	23	21	22	19	21	17	20	17	20
80	20	22	19	21	19	21	17	20	15	19	15	18
70	19	21	17	20	17	19	15	18	13	17	13	17
60	18	20	17	20	16	18	14	17	13	16	12	17
50	17	19	15	19	15	17	13	16	11	15	10	15
40	15	18	14	17	13	16	11	14	9	14	9	14
30	14	17	13	16	13	15	10	14	9	13	8	13
20	13	16	11	15	11	14	9	12	7	11	7	11
10	11	14	9	13	7	12	6	10	5	9	4	9

*Sit-and-reach scores measured in inches.

APPENDEX-C-A **4 weeks training program**

Table 5: 12-Week Training Protocol for Aerobic and Resistance Exercise Program

Aerobic exercise; The aerobic exercise was continuous running at intensity which is indicated in the protocol**(**50-70 MHR)

Day	Program	Duration	Weeks											
			1st week			2nd week			3rd week			4th week		
			Time	Set and Rep	Rest	Time	Set and Rep	Rest	Time	Set and Rep	Rest	Time	Set and Rep	Rest
Tuesday	**1.Warming up** Curl up , Push up, Barbell curl, Dumbbell curl , Dumbbell shoulder press, Bench press (Barbell squat, 3rd and 4th week) Continuous run 2. **Cooling down**.	40 min	5mi 5mi 5mi 3mi 3mi 3mi 5mi	1&1 1&1 1&1 20&2 8&2 10&2 1&1	1 min	5mi 5mi 5mi 3mi 3mi 3mi 5mi	1&1 1&1 1&1 20&2 8&2 10&2 1&1	1 min	5mi 5mi 5mi 3mi 3mi 3mi 5mi	1&1 1&1 1&1 20&2 8&2 10&2 1&1	1 min	5mi 5mi 5mi 3mi 3mi 3mi 5mi	1&1 1&1 1&1 20&2 8&2 10&2 1&1	1 min
Thursday	**1.Warming up**, Curl up , Bridge , Push up, Barbell curl, Dumbbell curl ,Dumbbell, shoulder press, Bench press, Barbell squat/ Aerobics dance **3.Cool down**	40 min	5mi 4mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&1 10&1 10&2 8&2 5&2 10&1 1&1	1 min	5mi 4mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&1 10&1 10&2 8&2 5&2 10&1 1&1	1 min	5mi 4mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&1 10&1 10&2 8&2 5&2 10&1 1&1	1min	5mi 4mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&1 10&1 10&2 8&2 5&2 10&1 1&1	1 min
Saturday	**1.Warming up** Curl up , Bridge , Push up, Barbell curl, Dumbbell curl ,Dumbbell, shoulder press, Bench press, Barbell squat/ Aerobics dance2.**Cooling down**	40 min	5mi 3mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&2 10&1 10&2 10&2 10&2 10&1 1&1	1 min	5mi 3mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&2 10&1 10&2 10&2 10&2 10&1 1&1	1 min	5mi 3mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&2 10&1 10&2 10&2 10&2 10&1 1&1	1 min	5mi 3mi 4mi 4mi 2mi 3mi 2mi 5mi	1&1 10&2 10&1 10&2 10&2 10&2 10&1 1&1	1 min

The above training schedule was performed every week of the month

Table 2: Second Month training Schedule (January, 2018), Total Duration 710 min, moderate intensity (50-70 MHR)

Day	Program	Duration	Weeks											
			1st week			2nd week			3rd week			4th week		
			Time	Set and Rep	Rest	Time	Set and Rep	Rest	Time	Set and Rep	Rest	Time	Set and Rep	Rest
Tuesday	**1.Warming up** Curl up , Bridge , Push up, Declined push up, Barbell curl, Dumbbell curl,Dumbbell shoulder press, Bench press, Aerobics dance 3. **Cooling down**.	50 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min
Thursday	**1.Warming up**, Curl up , Bridge , Push up, Declined push up, Barbell curl, Dumbbell curl, Dumbbell shoulder press, Bench press ,Barbell squat, Aerobics dance**2.Cool down**	50 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min
Saturday	**1.Warming up** Curl up , Bridge , Push up, Declined push up, Barbell curl, Dumbbell curl, Dumbbell shoulder press, Bench press ,Barbell squat -leg extension Aerobics dance 2.**Cooling down**	50 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min

The above training schedule was performed every week of the month

Table 3: Third Month Training Schedule (February, 2018), Total Duration 660min, moderate intensity (50-70 MHR)

Day	Program	Duration	Weeks											
			1st week			2nd week			3rd week			4th week		
			Time	Set & Rep	Rest	Time	Set & Rep	Rest	Time	Set & Rep	Rest	Time	Set & Rep	Rest
Tuesday	**1.Warming up** Curl up , Bridge ,Push up, Declined push up, Barbell curl, Dumbbell curl, Dumbbell shoulder press, Bench press , Barbell squat, Calf raise aerobic dance 2.**Cooling down**.	60 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	6mi 10mi 10mi 10mi 9mi 9mi 6mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min	5mi 4mi 4mi 5mi 3mi 3mi 2mi 5mi	1&1 10&3 10&3 10&3 10&3 10&3 10&2 1&1	1 min
Thursday	**1.Warming up**, Curl up , Bridge ,Push up, Declined push up, Barbell curl, Dumbbell curl, Dumbbell shoulder press, Bench press , Barbell squat, Calf Aerobic dance **2.Cool down**	60 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min
Saturday	**1.Warming up** Curl up , Bridge ,Push up, Declined push up, Barbell curl, Dumbbell curl, Dumbbell shoulder press, Bench press , Barbell squat, Calf, aerobic dance2.**Cooling down**	60 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min	5mi 4mi 5mi 5mi 3mi 3mi 4mi 4mi 5mi	1&1 10&3 10&4 10&3 10&3 10&3 10&2 10&2 1&1	1 min

The above training schedule was performed every week of the month

(Kang and Rata mess, 2014)

APPENDEX-D INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, coursework, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

Yes ☐

No ☐ ⟹ Skip to PART 2: TRANSPORTATION

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

_____days per week.

☐

No vigorous job-related physical activity ⟹ Skip to question 4

3. How much time did you usually spend on one of those days doing vigorous physical activities as part of your work?

_____hours per day

_____ Minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

_____ days per week

☐ No moderate job-related physical activity ⟹ Skip to question 6

5. How much time did you usually spend on one of those days doing moderate physical activities
as part of your work?

_____ hours per day

_____ minutes per day

6. During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part
of your work? Please do not count any walking you did to travel to or from work.
_____ days per week

☐ No job-related walking ⟹ Skip to PART 2: TRANSPORTATION

7. How much time did you usually spend on one of those days walking as part of your work?
_____ hours per day

_____ minutes per day

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram?_____ days per week

☐ No traveling in a motor vehicle ⟹ Skip to question 10

9. How much time did you usually spend on one of those days traveling in a train, bus, car, tram,
or other kind of motor vehicle?

_____ hours per day

_____ minutes per day

Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place.

10. During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place?

_____ days per week

☐ No bicycling from place to place ⟹ Skip to question 12

11. How much time did you usually spend on one of those days to bicycle from place to place?

_____ hours per day

_____ minutes per day

12. During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go
from place to place?

_____ days per week

☐ No walking from place to place ⟹ Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE AND CARING FOR FAMILY

13. How much time did you usually spend on one of those days walking from place to place?

_____ hours per day

_____ minutes per day

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the last 7 days in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

_____ days per week

☐ vigorous activity in garden or yard ⟹ Skip to question 16

15. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

_____ days per week

☐ No moderate activity in garden or yard ⟹ Skip to question 18

17. How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard?

_____ hours per day

_____ minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home?

_____ days per week

☐ No moderate activity inside home ⟹ Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY

19. How much time did you usually spend on one of those days doing moderate physical activities inside your home?

_____ hours per day

_____ minutes per day

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time?

_____ days per week

☐ No walking in leisure time ⟹ Skip to question 22

21. How much time did you usually spend on one of those days walking in your leisure time?

_____ hours per day

_____ minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do vigorous physical activities like aerobics,
running, fast bicycling, or fast swimming in your leisure time?

_____ days per week

☐ No vigorous activity in leisure time ⟹ Skip to question 24

23. How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time?

_____ hours per day

_____ minutes per day

24. Again, think about only those physical activities that you did for at least 10 minutes at a time.
During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time?
_____ days per week

☐ No moderate activity in leisure time ⟹ Skip to PART 5: TIME SPENT SITTING

25. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time?

_____ hours per day

_____ minutes per day

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the last 7 days, how much time did you usually spend sitting on a weekday?
_____ hours per day

_____ minutes per day

27. During the last 7 days, how much time did you usually spend sitting on a weekend day?
_____ hours per day

_____ minutes per day

This is the end of the questionnaire, thank you for participating.

APENDEX -D PAR –Q

Physical Activity Readiness Questionnaire

Regular Physical Group Exercise is fun and can be very sociable. Regular physical exercise also has a long list of health advantages and contributes greatly towards maintaining a long term healthy lifestyle. Becoming more physically active is very safe for MOST people; however SOME may need to check with their doctor or qualified exercise professional before beginning a new exercise program. Begin by answering the following and **HONESTLY.**

Please circle YES or NO:

DATA PROTECTION -Boogie Effect Limited ("Boogie Effect®") are committed to complying with the EU General Data Protection Regulation (GDPR) and the Data Protection Act 2018.Looking after the personal information you share with us is very important, and we want you to be confident that your personal data is kept safely and securely and to understand how we use it to offer you a better experience. For more information regarding our use of your personal data please refer to our Privacy & Cookies Policy via our website www.boogieeffect.com (a paper copy can be supplied on request)

SECTION 1 –PERSONAL DETAILS

NAME: _____DATE OF BIRTH: _____

ADDRESS:_____

_____

TELEPHONE Home: _____ Mobile: _____

EMERGENCY CONTACT DETAILS:

Name: _____ Telephone: _____

SECTION 2 -GENERAL HEALTH

❖ Have you ever been diagnosed with a heart condition, Chronic Heart Disease OR high blood pressure?

YES NO

❖ Have you had surgery recently (in the last 12 months)? **YES NO**

If YES, please specify: _____

❖ Do you suffer from dizziness, loss of balance OR lost consciousness in the last 12 months?**YES NO**

❖ Are you/could you be pregnant? **NO YES (**How many weeks/ Trimester?

_____)

❖ Do you smoke? **YES NO**

❖ Do you drink alcohol? **YES NO Units per week: _____**(optional)

❖ Do you feel pain in your chest during rest, daily activity or while undertaking physical activity? **YES NO**

❖ Do you suffer bone OR joint problems that could be made worse with physical exercise? **YES NO**

❖ Have you suffered an injury in the last 6 months which could be made worse with physical activity?

YES NO

If YES, Please specify_____

❖ Do you currently take prescribed medication for a chronic medical condition?

YES NO

❖ Are you required to carry your medication with you during exercise? **YES NO**

If YES, pleasespecify:_____

❖ Do you/have you suffered from any other chronic medical conditions such as asthma, diabetes, thyroid, hypertension, arthritis, cancer, stroke, depression, eating disorder or back problems? **YES NO**

If YES, please specify: _____

If you answered YES to one or more questions in section 2 please discuss it further with your fitness instructor.

You may be ready to undertake more physical activity but May basked to start slowly on a modified program. This would allow you to be part of the program but at a pace more suited to

your health and ability. You may be advised to consult with your doctor to discuss the appropriateness of this program. Begin carefully and cautiously until you feel comfortable and confident with the program. It is your responsibility to keep your instructor informed regarding your current health including any concerns regarding this program.

If you answered NO to the questions in Section 2, you are ready to undertake this Program of Physical Activity.

SECTION 3 –LIFESTYLE/PHYSICAL ACTIVITY (optional)

❖ How do you rate your physical activity at work?

Very Little Little Moderate Active Very Active

❖ How do you rate your physical activity in daily life (NOT at work; housework, gardening)?

Very Little Little Moderate Active Very Active

❖ Do you currently participate in any Physical Activity Program or Sport?

YES NO Specify: _____

❖ How physically fit do you feel at present?

Unfit Below Average AverageAbove Average Very Fit

❖ Why do you want to take part in this Fitness Program? (Circle ALL which apply)

Weight Loss Tone & Strengthen Maintain Fitness Level Improve Fitness Level

Sociability Time: Fits around work/home life Improve Health Maintain Healthy Lifestyle

SECTION 4–INFORMATION & MARKETING UPDATES (optional)

Entering your information in this section means you give explicit consent to your data being used for Information & Marketing purposes directly related to BOOGIE EFFECT®. You can Opt Out and change your mind at any time. Please refer to our Privacy Policy for more information. www.boogieeffect.com

Please indicate how you prefer to be contacted for information/updates, special offers or short notice cancellation of classes (Please circle as appropriate). Please leave BLANK if you DO NOT wish to be contacted:

Home Telephone Mobile Telephone Text Message Email

_____ _____ _____ _____

PLEASE NOTE

During this Fitness Program, every effort will be made to assure your safety. However, as with

any exercise program, there are risks of injury. This program involves the participation in Cardiovascular, resistance and flexibility exercise. It is your responsibility to inform your instructor of any changes to your health and wellbeing which may affect your ability to

participate in this program safely. The personal details included in this PAR -Q will be held in
accordance with the EU GDPR Act 2018 and NEVER passed to a third party.

DECLARATION

I the undersigned, have read, understood and completed this questionnaire to my full satisfaction
and the information contained herein is complete and accurate. I accept full responsibility for
my participation in this program. I understand the importance of keeping my health information up to date and it is my responsibility to inform the Program instructor as soon as any changes to my health and wellbeing occur.

The undersigned client has been approved to participate in this Program. Client

Signature _____ Instructor Signature: _____

Please Print: _____ Please Print: _____

Date: _____ Date: _____

Figure 1: APPENDEX –E Ethical Clearance

Ref.No. IHRERC/ 032/2019

Feb. 20/2019

To: **Graduate Studies Coordinating Office, the College of Health and Medical Sciences, Haramaya University**

From: Institutional Health Research Ethics Review Committee (IHRERC), College of Health and Medical Sciences, Harar Campus

Chair-person

Subject: **Ethical approval of research proposal**

It is known that various research proposals are passing through the IHRERC for ethical reviews. To this effect **Zewdie wondimagegn Alemu** a Graduate Student of the College; has submitted a research proposal entitled "**Effect of combined Aerboic and Resistance Training on Selected Hematological Paramters and Health Related Fitness Components of Haramaya University Sport Science Academy 1st Year Male Students, Oromia Regional State, Ethiopia"** through your office to the IHRERC. The committee has scrutinized the proposal for ethical issues and made the investigator for correcting and incorporating essential elements. The investigator has incorporated all elements as required by the committee. The committee has, therefore, approved for implementation the herewith attached and stamped 57 pages proposal unanimously through full consensus of eight members of the IHRERC on Feb. 19/2019. The IHRERC congratulates the investigator for the concerted efforts he made to fulfill the recommendations of the Committee.

Finally the IHRERC requests your Office, to inform officially the investigator to commence his data collection process by contacting for permission of the concerned authorities in the respected study area/ setting. However, since the IRERC is bestowed to make follow-up of the research process, the investigator is informed with a copy of this letter to report any changes in the research procedure and submit an activity progress report to the IHRERC **every three months.** A copy of the final report is also expected. At the back of this letter is the approval one pages format/certificate of the IHRERC.

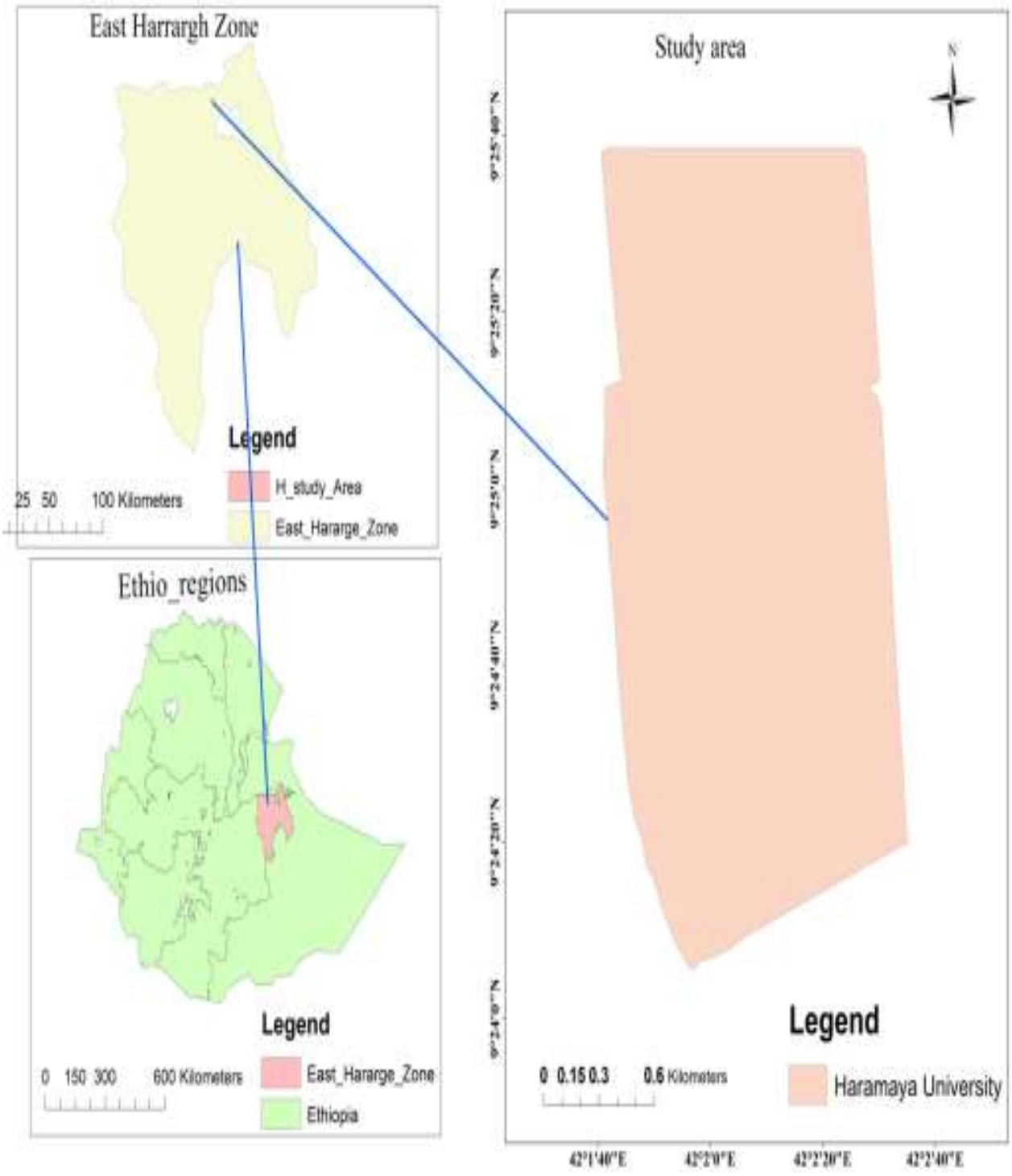
With Regards

CC:

➢ **Zewdie wondimagegn Alemu** (including one copy of the approved proposal).

APPENDEX –E

Figure 2: Figure 2: STUDY AREA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