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EFFECT OF AEROBIC DANCE ON MOTOR FITNESS VARIABLES OF FEMALE SPORT SCIENCE STUDENTS OF DEBRE BIRHAN UNIVERSITY, ETHIOPIA

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Abstract

The purpose of this study was to investigate the effect of aerobic dance on selected motor fitness variables of 3rd year female Sport Science students of Debre Birhan University. To conduct this research the investigator selected 40 female sport science students with age of 19-24 from Debre Birhan University sport science department after completed the health status questionnaire. The samples were selected by census sampling method and random sampling method and it was used to divide the samples into 2 groups i.e. control and experimental groups, each group consisting of 20 subjects, whereas their sex and the study place in relation with their department were selected by purposive sampling. The data collected from subjects were analyzed by SPSS version 20.0 and the comparison of mean value results were carried out by paired sample t-test. The level of significance was p<0.05. The finding of the present study showed from pre to post test was showed significant change for Illinois agility test (Mean Difference.142),sit and rich test (Mean difference 2.95) and stand balance stork test (Mean difference 3.05) for experimental group. However, in the control group there was not significance difference or improvement seen in all selected motor fitness variables. So this study concluded that 12week aerobic dance exercise have a positive effect on improving these selected motor fitness variables of 3rd year female sport science students of Debre Birhan university.

Key words: Aerobic dance, Agility, Flexibility, Motor fitness, Static balance

1. INTRODUCTION

1.1. Background of the Study

Sports science is a multidisciplinary field that investigates the mechanisms underlying the functioning of the healthy human body during exercise. It explores how sports and physical activities contribute to overall health and performance, examining these aspects from cellular to whole-body perspectives. The demand for sports scientists and performance consultants is on the rise, reflecting the growing emphasis in the sports world on achieving optimal results. Researchers in this field have significantly advanced our understanding of how the human body responds to exercise, training, diverse environments, and various stimuli (source: https://en.wikipedia.org/wiki/Sports_science, May 15, 219).

Aerobic dance involves rhythmic and repetitive movements that engage large muscle groups in the arms and legs for a minimum of twenty minutes per session. This activity creates a demand for a continuous supply of oxygen, resulting in the aerobic dance training effect. This effect induces physiological changes that improve the lungs, heart, and blood vessels' ability to transport oxygen throughout the body (Sridhar, 2017).

Aerobic dance is a fitness sport that combines the health and physique benefits of jogging with the enjoyment of dancing. It offers a dynamic and entertaining way to stay fit by incorporating fat-burning aerobic movements, muscle-building exercises, and stretching into routines set to music. The use of music serves as a motivational technique, a trend that has gained momentum in recent years.

Aerobic dancing consists of callisthenic exercise movements performed in coordination with music, challenging the heart and lungs to work harder than at rest. For sports science students, engaging in aerobic dance is a demanding yet rewarding experience. They perceive it as a performance that simultaneously tones their bodies and strengthens their cardiovascular systems (Bavlı, 2016). Previous studies on agility, flexibility, and static balance in handball

and basketball players have indicated positive effects resulting from step aerobic dance practices (Bavlı, 2016).

2. Objective of the Study

General objective

The general objective of this study was to investigate the effect of aerobic dance on selected motor fitness variables of female Sport Science students of DBU.

Specific objectives

1. To identify the effect of aerobic dance on agility of 3rd year female sport science students of DBU.
2. To investigate the effect of aerobic dance on flexibility of 3rd year female sport science students of DBU.
3. To assess effect of aerobic dance on static balance of 3rd year female sport science students of DBU.

3. MATERIALS AND METHODS

3.1. Description of the Study Area

The study was conducted at Debre Birhan University, situated in the North Shewa Zone of the Amhara Regional State, approximately 150 km northeast of Addis Ababa on the paved highway to Dessie. The town is positioned at a latitude of 9°41′N and a longitude of 39°32′E, with an elevation of 2,840 meters. Debre Birhan town is characterized as one of the coldest cities in the sub-tropical zone of Ethiopia, with an average annual temperature of 17.8°C during the day and 8.83°C at night (source: https://www.meteoblue.com/en/weather/forecast/modelclimate/debrebirhan_ethiopia).

Debre Birhan University offers a range of courses and programs leading to officially recognized higher education degrees, including Bachelor Degrees in various areas of study. The university provides both academic and non-academic facilities and services to students, such as a library and administrative support. The town itself is located between latitudes 9° 40´

46.3440" N and longitudes 39° 31´ 57.4320" E, approximately 128 km from Addis Ababa. The campus sits at an altitude of 2830 meters above sea level, with a mean annual temperature of 14.84°C (source: https://en.wikipedia.org/wiki/Debre_Berhan_University).

3.2. Research Design

The study employed a true experimental study design with the aim of investigating the effect of aerobic dance on selected motor fitness variables among female sport science students at Debre Birhan University.

3.3. Sources of Data

Primary data were collected through the administration of an experimental process, including pre and post-test results.

3.4. Study Population

The study population comprised 3rd-year female sport science students at Debre Birhan University, totaling 40 students.

3.5. Sample Size and Sampling Technique

The sample consisted of 40 physically active 3rd-year female sport science students from Debre Birhan University, aged between 19-24 years. A census method was employed, and simple random sampling was used to assign subjects to two groups: an experimental group and a control group, each consisting of 20 students.

3.6. Inclusion and Exclusion Criteria

All 3rd-year female sport science students were included in the study population after completing health history and fitness status questionnaires. Inclusion criteria involved completing the health history questionnaire, while exclusion criteria included medical conditions, recent physical injuries, and ages outside the range of 19-24. Individuals with

cardiovascular diseases, smokers, those on regular medication, individuals with psychiatric disorders, and those with recent physical injuries were excluded from the experimental trial.

3.7. Method and Procedure of Data Collection

3.7.1. Method of Data Collection

Quantitative data were collected through pre-tests and post-tests using appropriate motor fitness test measures, including the Illinois agility test for agility, sit and reach test for flexibility, and stroke balance test for static balance. Aerobic dance training was provided for 12 successive weeks, three days per week (Monday, Wednesday, Thursday), with each session lasting 1:00 hour for 3rd-year female sport science students at Debre Birhan University. The researcher, aided by an assistant data recorder, documented the data.

3.7.2. Procedure of Data Collection

After obtaining ethical clearance, the researcher met with the participants during a familiarization session. Participants were informed of all procedures and familiarized with performance measures to reduce the possibility of a learning effect. Pre-tests of selected motor fitness variables were administered before the aerobic dance training program. The experimental group underwent a twelve-week aerobic dance training program, three days per week (Monday, Wednesday, Thursday), each session lasting 1:00 hour. The study employed a pre-test and post-test design, and the results were recorded by the researcher and the assistant data recorder at the same time of day for each subject.

3.8. Fitness Test Procedure or Protocol

The study incorporated the following fitness tests to assess selected motor fitness variables during both pre-test and post-test phases:

3.8.1. Illinois Agility Test (IAT)

The IAT is a widely employed agility test in sports, assessing one of the key components of physical fitness. The course measures 10 meters in length and 5 meters in width, marked by four cones denoting the start, finish, and two turning points. Another set of four cones is evenly spaced down the center at 3.3-meter intervals. Subjects begin lying on their front, hands by their shoulders. Upon the 'Go' command, the stopwatch starts, and participants swiftly rise, covering 10 meters to circumvent a cone, then return 10 meters, navigate through a slalom course of four cones, and conclude by running another 10 meters past the finish line. Multiple trials are conducted, with the best score recorded (Juhász & Karsai, 2013).

3.8.2. Sit and Reach Flexibility Test

The sit and reach test is a standard measure of flexibility, specifically targeting the lower back and hamstring muscles. This test is crucial as tightness in these areas is linked to lumbar lordosis, forward pelvic tilt, and lower back pain. The warm-up session lasts 5–10 minutes, incorporating low-intensity aerobic activity and stretching of hamstrings and the lower back. To perform the test:

- A standard meter rule is placed on the sit-and-reach box for each test, aligning with the heel position, with a reading of 23 cm.
- Subjects remove shoes, sit with feet hip-width against the box, extend their knees, interlace hands, and reach forward along the measuring board.
- The test is repeated three times, and the best measurement is recorded in centimeters, rounded to the nearest 0.5 cm (Pedro et al., 2009).

3.8.3. Stork Balance Stand Test

The Stork Balance Stand Test evaluates balance. Participants, standing on one leg with hands on hips, place the other leg on the inside knee of the supporting leg. After one minute of exercising balance, they stand on the heel, attempting to maintain balance. The stopwatch is initiated when the heel is raised and stopped if any of the following occurs: hands are removed from hips, the foot on the floor moves or hops, the other leg loses contact with the knee, or the heel of the supporting leg touches the ground. The total time in seconds is recorded, with three

attempts, and the best result is noted. The test is conducted on a flat, non-slip surface, utilizing a stopwatch, paper, and pencil (source).

3.9. Methods of Data Analysis

Collected data from motor fitness assessment tests were coded and organized for analysis using SPSS version 20.0. The paired T-test was employed to summarize the changes, and the level of significance was set at < 0.05%.

3.10. Data Quality Control

To ensure the quality of data for selected motor fitness variables (agility, flexibility, and static balance), standardized fitness tests were utilized with appropriate tools. To minimize potential errors during data collection, an assistant fitness test recorder was trained under the technical guidance of the Sport Science Department.

3.11. Ethical Considerations

Ethical approval was obtained from the Ethical Health Review Committee of Haramaya University. The study adhered to university rules, codes of conduct, and policies related to research ethics. Guarantees of confidentiality were provided, and the study was conducted in compliance with ethical standards to mitigate any risks associated with participation.

4. RESULTS AND DISCUSSIONS

4.1. Overview

The research was aimed to examine the Effect of 12week Aerobic dance exercise on Selected Motor Fitness Variables in Case of female Sport Science Students of Debre Birhan University. To achieve the purpose of these study 40 female students from Debre Birhan University sport science department were selected as study subjects and their age was 19-24 years. The study subjects were selected in Debre Birhan University sport science department from 3rd year. The participants were engaged in a designed aerobic dance exercise program for 12weeks and 3 days per week for 60 minutes. In this study, Motor fitness tests were taken two times at before

the start of the experiment (Pre) and at the end of 12 week (Post exercise test). Under this, three motor fitness variables such as agility, flexibility and static balance had been evaluated by Illinois agility test, sit and reach tests and stork balance stand test respectively. The collected data were analyzed by paired sample t-test using SPSS version 20. The results of those variables are discussed below in the tables and figures.

4.2. Demographic Characteristics of the Study Subjects

A total of 40 female Sport Science Students of Debre Birhan University were selected as study subjects and divided in to two groups, 20 experimental and 20 control groups. From the total number of the study subjects; no one was lost. 100% of the experimental study subjects were followed up the training program properly from initial till end.

Table 1: Demographic characteristics of participants (mean ± standard deviation)

No	Group	Age(years)	Height (m)	Weight (kg
1	Experimental group	20.56±1.47	1.6±.06	50.4±3.83
2	Control group	20.9±1.6	1.6±.06	50.15±4.06

The above table shows the age, height and weight of the study subjects for both experimental and control group. So, as we observe there were no significant difference in both groups for all variables.

4.3. Illinois agility test results and discussions

Table 2: Mean and standard deviation values of Illinois agility test results of the study subjects (second).

Group	N	Variables	Pre test	Post test
EG	20	IAT	22.19 ± 1.49824	22.0480 ± 1.47944
CG	20	IAT	22.1745±2.10491	22.1360 ± 2.13018

Values (mean + SD), IAT: Illinois agility *test, EG: Experimental group, CG: Control group*

As the above table showed there was significant difference observed between pretest and post test results on the experimental group rather than control group in agility of the study subjects. Thus, as its indicated on the table the average value of agility was significantly increase for the experimental group after twelve week aerobic exercise training, The mean value of agility for experimental group was 22.19±1.49824 before they underwent to the aerobic dance exercise and 22.0480±1.47944 after 12 week aerobic dance exercise training when compared to mean value of agility for control group 22.1745±2.10491and 22.136.6±2.13018which was taken as pre and post test result respectively with the mean value difference were considered statically significant at $p<0.05$. So from the above table we can say that there is significance change in agility of post test result on experimental group due to 12week aerobic exercise. However, in the control group there was not significant change as we can observe in the table. Hence, based on this result 12 week aerobic dance exercise have a positive effect on agility of 3rd year female sport science student of DBU that means the null hypothesis was rejected while the alternative hypothesis accepted.

This result is in agreement with a research which is conducted by the title Impact of aerobic dance training on motor fitness parameters and dribbling ability of football players conclude that 12 weeks twelve weeks aerobic dance significantly improved the agility and flexibility of the athletes. In addition the researchers suggest that aerobic exercise is the most appropriate means to bring the desirable change on the selected variables (R Sridhar and RG Giridharaprasath, 2017).Hallage et al. (2010) found that strength of the upper and lower body; dynamic balance and agility, flexibility and cardio respiratory fitness were significantly positively affected after step aerobic exercises in adults. Similar findings were reported by Mori et al. (2006) who found that a bench step exercise program effectively improved aerobic capacity, lower extremity power and static balance ability in the elderly.

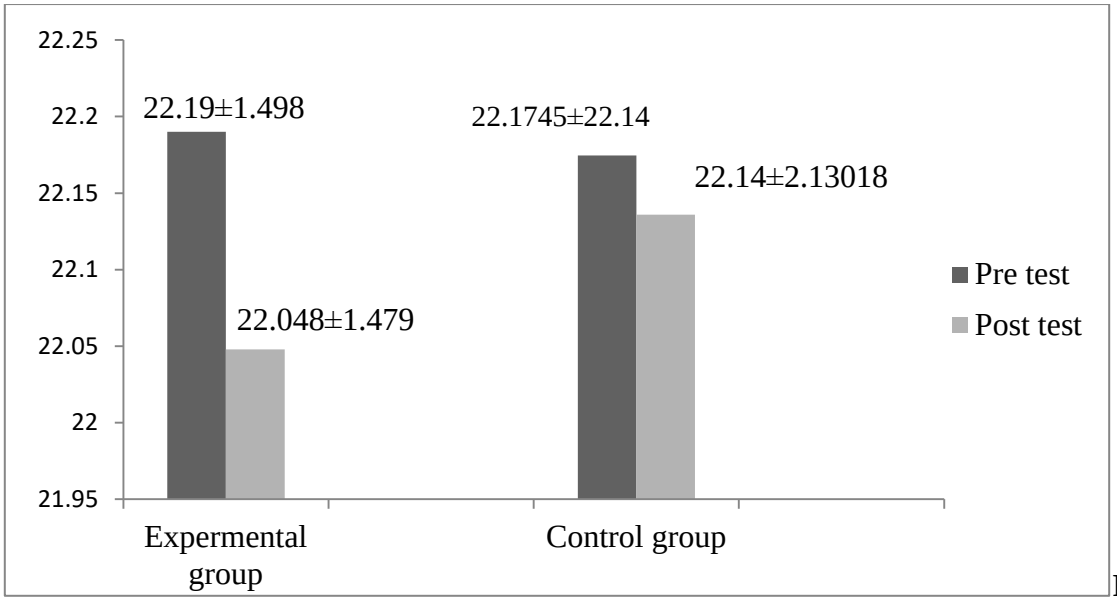

Figure 1: The mean comparison of Illinois agility test results of the study subjects between pre and post tests.

The above table showed that there was significant difference on Illinois agility test of pre to post test result on the experimental group rather than control group due to 12 week aerobic dance exercise. So, aerobic dance exercises have a positive effect on agility of 3rd year female sport science students.

4.4. Sit and Reach test results and discussions

Table 3: Mean and standard deviation values of Sit and Reach test results of the study subjects (centimeter).

Group	N	Variables	Pre test	Post test
EG	30	SRT	20.05±1.53811	23±1.29777
CG	30	SRT	19.6±1.72901	19.8±1.90843

Values (mean + SD), SRT: Sit and reach test, EG: Experimental group, CG: Control group

As the above table showed there was significant difference observed between pre test and post test results on the experimental group rather than control group in flexibility of the study

subjects. Thus, as its indicated on the table the average value of flexibility was significantly increase for the experimental group after twelve week aerobic exercise training, The mean value of flexibility for experimental group was 20.0500±1.53811before they underwent to the aerobic dance exercise and 23.0000±1.29777after 12 week aerobic dance exercise training when compared to mean value of flexibility for control group 19.6000±1.72901and 19.8000±1.90843which was taken as pre and post test result respectively with the mean value difference were considered statically significant at $p<0.05$. So from the above table we can say that there is significance change in flexibility of post test result on experimental group due to 12week aerobic dance exercise. However, in the control group there was not significant change as we can observe in the table. Hence, based on this result 12 week aerobic dance exercise have a positive effect on flexibility of 3rd year female sport science student of DBU that means the null hypothesis was rejected while the alternative hypothesis accepted.

This result is in agreement with a study which is conducted by the title Investigation into the Effects of Eight Weeks of Step Aerobic Dance Practice on Static Balance, Flexibility and Selected Basketball Skills in Young Basketball Players showed that step aerobic exercises provided significant improvements in basketball skills of young basketball players by improving their balance and flexibility performance (ÖzhanBavlı; 2016). Nikić and Milenkovic (2013) noted that step aerobics practice significantly improved flexibility, static balance and body composition of young girls.

Hallage et al. (2010) found that strength of the upper and lower body; dynamic balance and agility, flexibility and cardio-respiratory fitness were significantly positively affected after step aerobic exercises in adults. Similar findings were reported by Mori et al. (2006) who found that a bench step exercise program effectively improved aerobic capacity, lower extremity power and static balance ability in the elderly.

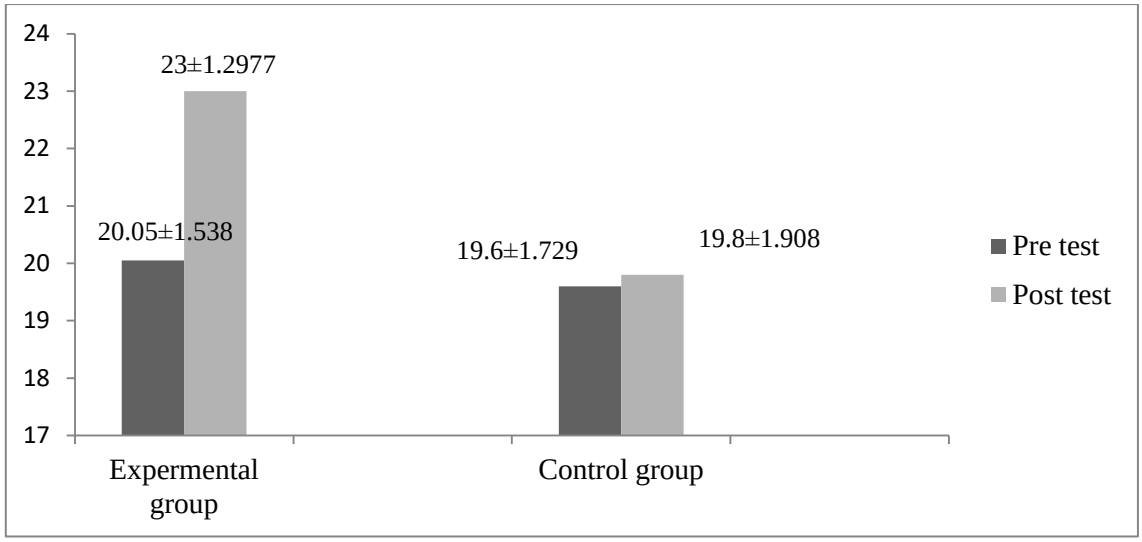

Figure 2: The mean comparison of Sit and rich test results of the study subjects between pre and post tests.

The above figure clearly showed that there was a significant difference observed between pre test and post test results on the experimental group rather than control group in flexibility of the study target group.

4.5. Stork Balance Stand Test results and discussions

Table 4: Mean and standard deviation values of Stork Balance Stand Test results of the study subjects (second).

Group	N	Variables	Pre test	Post test
EG	20	SBST	23.85±3.24889	26.9±3.9855
CG	20	SBST	21.6±2.3486	21.8±2.745

Values (mean + SD) SBST: Stork balance stand test, EG: Experimental group, CG: Control group

As the above table showed there was significant difference on stork balance stand test of pre to post test result on the experimental group. As indicated on the table, the mean value of stork balance stand test for the experimental group was increase from pre test mean value

(23.85±3.24889) to post test mean value (26.9±3.9855) due to the 12 week aerobic dance exercise when compared to the mean value of stork balance stand test for control group before the experiment started (21.6±2.3486) and (21.8±2.745) after 12week. Thus, the finding shows that 12week aerobic dance exercise was significantly improve the balance of the experimental group at difference between mean values were considered statically significant at $p<0.05$. On the contrary, there was not significant improvement in the control groups as showed in the above table. So, based on this result 12 week aerobic dance exercise have a positive effect on balance of 3rd year female sport science student of DBU that means the null hypothesis was rejected while the alternative hypothesis accepted.

Some literature evidence suggests that a superior balance among sport science students is the result of repetitive training experiences through aerobic exercise that influence motor responses (Belter et al., 2004); others argue that superior balance is the result of training experience influencing a person's ability to attend to relevant proprioceptive and visual cues (Ashton-Miller et al., 2001).

The Stork Balance Stand Test result was compared with an international Stork Balance Stand Test norm among similar age groups that range above 19years (Schell, J and Leelarthaep 1994).The Stork Balance Stand Test norms is 37-50 for these age groups while the Stork Balance Stand Test mean value result of this study for experimental group was 47.54. Hence, the study result has fallen in above average standard (norms found on Appendix VII).

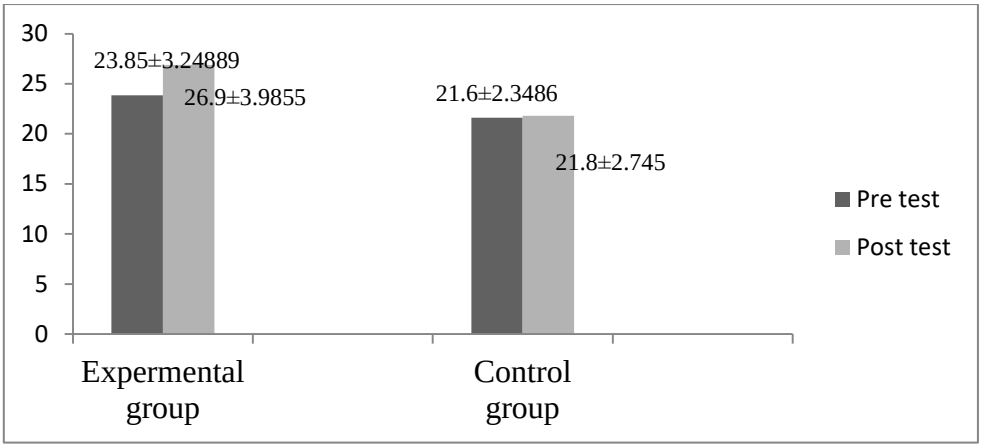

Figure 3: The mean comparison of Stork Balance Stand test results of the study subjects between pre and post tests

The above figure showed that there was significant difference on stork balance stand test of pre to post test result on the experimental group rather than control group due to 12 week aerobic dance exercise. So, aerobic dance exercises have a positive effect on balance of 3rd year female sport science students.

4.6. The mean difference values and significance level of each variables

Table 5: the mean difference values and significance levels of pre and post test result of subject in all variables i.e., Agility, Flexibility and Static Balance.

Variables	Groups	Parameter(A)	Parameter(B)	MD (A-B)	SIG
Agility	EG	PoT (22.0480)	PT (22.19)	-.196	.003
	CG	PoT (22.1360)	PT (22.1745)	.0385	.198
Flexibility	EG	PoT (23.0000)	PT (20.05)	2.95	.000
	CG	PoT19.8000)	PT (19.6)	.20	297
Static Balance	EG	PoT (26.9)	PT (23.85)	3.05	.000
	CG	PoT(21.8)	PT (21.6)	.20	.297

MD: Mean difference, SIG: Significance level, PoT: Post Test, PT: Pre Test, EG: Experimental Group, CG: Control Group

As the above table indicated that both variables (agility, flexibility and static balance) showed positive improvement on the experimental group of the study because of 12 week aerobic dance exercise, however there was not significant change or improvement showed on the control group of the study in all parameters. As a result 12week aerobic dance exercise was significant in order to improve these selected motor fitness variables of the study.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The study assessed and tried to investigate the Effect of Aerobic dance Exercise on Selected Motor Fitness Variables of Female Sport Science Students of Debre Birhan University. To achieve the purpose of this study, 40 3rd year female sport science students with age of 19-24 years were selected by census method and by random sampling method divided into 2 groups i.e. control and experimental group, each group consisting of 20 students that the experimental group underwent twelve weeks aerobic dance exercise program, three days per week and the duration was 1hour. Thus, forty (40)3rdyear female sport science students of DBU were filled the health status questionnaire, all are free from health problem so, finally Forty (40) subjects were participated on this study. In this study, the effect of Aerobic Dance Exercise on agility, flexibility and static balance have been seen. The dependent variables selected for this study were agility, flexibility and static balance. Motor fitness tests used were; Illinois agility test, Sit and Reach test and Stork Balance Stand Test within two intervals (pre-test and post-test) each.

The data were collected by using the appropriate motor fitness tests before the starting of 12 week aerobic dance exercise and after 12week aerobic dance exercise training. Paired T-test was used for comparisons of means and data were analyzed by SPSS version 20 with significance level of 0.05%. Final result of the study summarized and demonstrated that the result of post test to pretest showed significant improvement in the experimental group in both parameters (agility, flexibility and static balance) while, in the control group there was not significant improvement shown. Generally the improvement was seen in the experimental group of the study as all variables were tested. As a result we can conclude that 12 week

aerobic dance exercises have a positive effect on DebreBirhanUniversity3 rd year female sport science students motor fitness performance.

5.2. Conclusions

According to the results, the following conclusions were made.

- It is conclude that 12 week aerobic dance exercise showed significant improvement on agility of DBU 3rd year female sport science students
- Aerobic dance exercise significantly improved flexibility of DBU 3rd year female sport science students.
- The static balance of the experimental study target group also increased after 12 week of aerobic dance exercise training.

5.3. Recommendations

Based on the major findings and conclusions of the study, the following points were made as recommendations.

- Aerobic dance exercises of three months were effective in increasing performances of agility, flexibility and static balance in female sport science students of DBU. Therefore, aerobic dance training methods are recommended to female sport science students for improving their agility, flexibility and static balance
- Efforts might be taken to popularize the benefits of aerobic dance exercises to DBU female sport science students, which, in turn would make the nation to produce skillful and physically fit generation.
- It is highly recommended that sport and exercise science professionals could guide and train on selected aerobic dance exercises to achieve the advancement of general physical fitness qualities.
- Further research on effect of aerobic dance exercises ought to be conducted for further understanding of aerobic dance exercises.

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7. APPENDICES

APPENDIX A

Physical Activity Readiness Questionnaire (PAR-Q)

Please read the following questions carefully and indicate your correct responses to each question by ticking (X) for your answer "YES" or "NO"

Table 1: Health status questioner

NO	Questions	Yes	No
1	Do you have a bone or joint problem such as arthritis, which has been aggravated by exercise or might be made worse with exercise?		
2	Do you have high blood pressure?		
3	Do you have low blood pressure?		
4	Do you have Diabetes mellitus or any other metabolic disorder?		
5	Do you have or ever suffered from heart condition?		
6	Have you ever felt pain in your chest when you do physical exercise?		
7	Is your doctor currently prescribing you drugs or medication?		
8	Have you ever suffered from shortness of breath at rest or with mild exercise?		
9	Is there any history of Coronary Heart Disease within your family?		
10	Do you currently smoke?		

If you have answered **YES** to any of the above questions please give details: ———————

_____

_____

Source: *Canadian Society for Exercise Physiology*. Revised 1994

APPEDDIX- B

Participants Information Sheet and a Consent Form

Researcher`s Name: Elsabet Gebeyehu Ahemed
Major Advisor`s Name: Desta Enyew (PhD)
Co-Advisor's Name: Shemelis Mekonnen (PhD)

Thesis Title: Effect of Aerobic Dance Motor Fitness variables of Female Sport Science Students of Debre Birhan University, Ethiopia you are being asked to participate in this research study as described below. All research studies carried out like this one are governed by the regulations for research on human beings. These regulations require that the researcher should obtain a sign agreement (consent) from you to participate in this research project. The researcher will explain to you in the detail purpose of the project, the procedures to be used, the potential benefits and the possible risk of participation in this study. You can ask a researcher any questions that you may have about a study and expect to receive satisfactory answers regarding the same. A basic explanation of the project is summarized below.

1. **Purpose and procedures**

The purpose of this research project is to examine the Effect of Aerobic Dance on Motor Fitness Variables of Female Sport Science Students of Debre Birhan University, Ethiopia. The target groups to be involved in this study will be 36 male students. This study requires your participation to perform a certain tests in measuring the Agility, Flexibility and Static Balance variables.

2. **Risks and Safeguards**

The risks of this research study are small. While administering the tests and during training sessions you may experience localized skeletal muscle fatigue. You might feel some muscle soreness and fatigue during and after the cessations of the training exercises and tests. But we do not expect any unusual risks as a direct result of this study. If any unexpected physical injury occurs, appropriate first aid will be provided, but no financial compensation will be given.

3. **Confidentiality**

The information obtained about you will be kept in confidence, although you are free to release it to your own physician. The information will be used only for scientific purposes without identifying you as an individual.

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I certify that I have fully understood the above project; therefore, I consent to participate in this study.

Name of target: ----------

Signature: ----------

Address: ----------

Date: ----------

I certify that I clearly explained the nature of the study, purpose of potential benefits and that may be possible risks involved in this research study.

Signature of Investigator: ----------

Date: ----------

APPENDIX-C

Selected Motor Fitness Variables Test Result Record Sheet of Target Group

Groups (Control or Experimental group)

Name_____ Initial Height/M _____

Age_____ Initial Weight/Kg_____

Sex_____ Code_____

Table 2: Selected Motor Fitness Variables Test Result Record Sheet

Test Code	Type of Test	Parameters To Be Measured	Experimental Group		Control Group	
			PT	PoT	PT	PoT
T-1	Illinois agility run	Agility (per minute)				
T-2	Sit and reach	Flexibility (cm/inches)				
T-3	Stork balance stand	Static balance (Test per minute)				

APPENDIX - D

Description of the Training Schedule

The students of sport science need fitness as they are involved in various vigorous practical activities during their practical class. As a result, the research was done at Debre Birhan University sport science third year female students. They have practical class they don't involve in regular exercise mainly in aerobic dance for the purpose of improving their agility, flexibility and static balance and research was not conducted on this topic.

Training protocol

According to Jakl (2008) 8 to 12 weeks of training program is essential to maximize individual's physiological fitness abilities. Based on this idea the investigator purposively prepared 12 weeks training program. Thus, the subjects underwent 3 months (12weeks) of training, which is December - February 2020).

The Training Days per Week

According to ACSM (1990) 3-5 days per week and 20-60 minutes is needed for developing and maintaining fitness through aerobic exercise. So, the investigator took a minimum of 3 days (60 minutes per session) that are Monday Wednesday and Friday since they are student

the schedule was prepared by considering their convenient time for them. The researcher was under taken pre and post test to know the change that occurred due to the 12-week aerobic dance exercise and the dependent variables for this study were agility, flexibility and static balance, independent variable is also aerobic dance exercise.

The following table includes different types of aerobic exercise which was performed by the subjects within 12 weeks in order to improve their agility, flexibility and static balance. The exercises involve in this study were warming up exercise, step aerobic exercise like: turn step, step touch, box step V-step and basic stepand finally cooling down exercise which helped to develop athletes' fitness level. Also FITT (Frequency, Intensity, Time and Type of Exercise) principle of training was applied in the schedule;

1. **Frequency of training**: the repetition of exercise in one set. The training schedule was completed 3 days per week that is Monday, Wednesday and Friday.

2. **Intensity of training**: is how hard the body exercising or how much energy is expended when exercising. It can be defined on either an absolute or a relative scale. Absolute intensity refers to the amount of energy expended per min of activity, while relative intensity takes a person's level of exercise capacity or cardio respiratory fitness into account to assess the level of effort. Either scale can be used to monitor the intensity of aerobic dance exercises • In this study the researcher was used low intensity, moderate intensity to adapt the exercise to high intensity for increasing load in the consecutive three months. There were ways to measure intensity of training;

- Heart rate - Heart rate can be an indicator of the challenge to the cardiovascular system that the exercise represents.
- VO_2max- the amount of oxygen consumed by the body during exercise

Exercise is categorized into three different intensity levels. These levels include **Low** (40-50% MHR), **Moderate** (50-65% MHR), and **Vigorous** (65-85% MHR) for aerobic dance exercise and are measured by the metabolic equivalent of task. The effects of exercise were different at each intensity level (i.e. training effect). Recommendations to lead a healthy lifestyle vary for individuals based on age, weight, and existing activity levels. "Published guidelines for healthy adults' state is that 20-60 minutes of medium intensity continuous or intermittent

aerobic activity 3-5 times per week is needed for developing and maintaining fitness" (ACSM, 1990).

4. **Duration of training**: the subjects perform the exercise for 60 minutes per day in this study. Duration is dependent on the intensity of the activity, thus, medium-intensity
5. Activity should be conducted over a longer period of time (25 min or more) and conversely individuals training at higher levels of intensity should train at least 10min or longer (ACSM, 1990).

4. **Type of activity**: any activity that uses large muscle groups, which can be maintained continuously, and is rhythmical and aerobic in nature, e.g., walking-hiking, running, jogging, bicycling, cross-country skiing, aerobic dance/group exercise, rope skipping, rowing, stair climbing, swimming, skating, turn step, step touch, box step V-step and basic step and various endurance game activities or some combination thereof (ACSM, 1990). .

- Basic Step

This move can be performed on an aerobics step bench or on the floor. Do several in a row with the lead leg, or alternate lead legs for variety

How to do it**:** Start with your feet side by side, about hip-distance apart. Step about two feet forward with your lead leg. Bring the back leg forward to meet it. Step back two feet with your lead leg and draw the other foot back to meet it. (Outevsky, *et al.,* 2015)

- V-Step

This dance step is also doable on an aerobic step or the floor. It gets its name from the wide, v-shape of the movement.

How to do it**:** Stand with your feet parallel and hip-distance apart. Step your lead foot 2 to 3 feet forward to the corresponding corner of the floor or the bench. Step the opposite foot wide to its corner. Step back to the original position with your lead leg. Bring the opposite leg back to meet it. You may alternate lead legs or repeat the step on the same leg several times before switching. (Outevsky, *et al.,* 2015)

- Step Touch

Step touch is commonly found in floor-based classes. It's an easy move to master.

How to do it: Stand with your feet side by side and hip distance apart. Step your lead leg to the side and bring the other foot to meet it. Switch the direction as you alternate touching side to

side. Sometimes, you might do two to four steps to the right, and then an equal number to the left (or vice versa). (Outevsky, *et al.,* 2015)

- Mambo

The mambo step in aerobics dance takes its cue from the dance style. It's a fundamental move that has you swinging your hips.

How to do it**:** Stand with your feet hip-distance apart. For a right leg lead, take a small step forward on your right foot; keep your left foot where it is. Shift weight onto the right foot, and then shift weight onto the left foot as you step the right foot backward. Shift weight onto the right foot, then to the left; immediately take the step forward with the right to repeat the step. (Outevsky, *et al.,* 2015)

- Box Step

A box step is sometimes called a "jazz square."How to do it**:** Stand with your feet hip-distance apart and parallel to one another. For a right leg lead, step the right foot slightly forward and in front of your left foot. Step the left foot out to the side. Bring the right foot a step back and cross over it with your left foot. Repeat multiple times. (Outevsky, *et al.,* 2015)

- Grapevine

The grapevine offers a way to travel side to side during a floor-based aerobics class. Sometimes, an instructor adds a knee lift or hamstring curl instead of the tap before switching directions.

How to it**:** Stand with your feet hip-distance apart. To move to the right, step your right foot to foot next to it to switch directions. (Outevsky, *et al.,* 2015)

- Turn step

Do the turn step on an aerobic bench, also in four counts. Start the move facing the step sideways.

How to do it: Leading with the right foot, step up on right corner of the bench sideways. Then bring the left foot up onto the bench to the left corner as you turn. Step off the bench with the right foot; bring the left foot down next to the right foot. Repeat with the left side for as many reps as desired. (Outevsky, *et al.,* 2015)

5. **Load and Effort:** Within the area of aerobic dance exercise, intensity is generally considered to represent the effort required by the body at a given velocity, incline, and resistance (or other variable) at a given work rate and is typically expressed relative to

quantities such as heart rate (HR), % of heart rate maximum blood lactate or oxygen uptake (VO_2). With regard to muscular effort, however, the percentage of one repetition maximum is purely a representation of **load**. Whilst increasing or decreasing a given load might indeed require greater or lesser effort, it should never be considered a measure of the effort or intensity that the body is working at. It is surely not acceptable that terminology can be used with different meanings based on differing modalities of exercise being performed (Fisher and Smith, 2012).

Components of workload

1. The amount of weight lifted during an exercise.
2. The number of repetitions completed for a particular exercise.
3. The length of time to complete all exercises in a set or total training session

The table of training schedule of this study for three months is listed in the next pages

APPENDIX-E

Aerobic Dance Training Schedule for Three Months

Table 3: First Month Training Schedule (December 2019)

Days per week	Type of Exercise	Duration 60 min	Sets & Repetition		Intensity of exercise
Monday 5:00pm-6:00pm	**Warming up exercises**: For general and specific body.	10 min	2*4 repetition for each	30 second for each rep	Low intensity 40-54 %
	Step aerobic dance exercises	40 min			
	-hip role				
	Mambo				
	-Box-step				
	-V step				
	-Basic-step				
	-kick box				
	- Jumping jack				
	-Air squats				
	-walk and kick				
	- turn step				
	-Step touch				
	-Knee up				
	Cooling down exe -Dynamic &static stretching.	10 min			
	warming up exercises:	10 min			

Wednesday 5:00pm-6: 00pm	-For general and specific body				
	Step aerobic dance exercises	40min	2*4 repetition for each	30 second for each rep	Low intensity 40-54 %
	- Walk and kick				
	-Step touch				
	- Box Step				
	- V step				
	-kick box				
	- Jumping jack				
	-On spot marching -Side-Step Toe Touches -Grapevine - Basic Step - Knee up - Air squats				
	Cooling down exe -Dynamic &static stretching.	10 min			
Friday 5:00pm-6:00pm	**warming up exercises:** For general and specific body.	10 min			
	Step aerobic dance exercises.	40 min	2*4 repetition for each	30 second for each rep	Low intensity 55-69 %
	-Knee rise				
	Walk and kick				
	-Basic step				
	-V step				
	-Box step				
	-Buttock kick				
	-Air squat				
	- turn step				
	-Step touch				
	-kick box				
	- Jumping jack				
	-Squat				
	Cooling down exe. -Dynamic &static stretching.	10 min			

The above schedule was performed on December, 2019.

APPENDIX -F

Table 4: Second Month Training Schedule (January, 2020)

Days per week	Type of Exercise	Duration 60 min	Sets & Repetition		Intensity of exercise
Monday 5:00pm-6:00pm	**Warming up exercises**: For general and specific body.	10 min	2*6 repetition for each	30 second for each rep	Moderate intensity 55-69%
	Step aerobic dance exercises	40 min			
	-hip role				
	Mambo				
	-Box-step				
	-V step				
	-Basic-step				
	-kick box				
	- Jumping jack				
	-Air squats				
	-walk and kick				
	- turn step				
	-Step touch				
	-Knee up				
	Cooling down exe -Dynamic &static stretching.	10 min			
Wednesday 5:00pm-6: 00pm	**warming up exercises:** -For general and specific body	10 min			
	Step aerobic dance exercises	40min	2*6 repetition for each	30 second for each rep	Moderate intensity 55-69 %
	- Walk and kick				
	-Step touch				
	- Box Step				
	- V step				
	-kick box				
	- Jumping jack				
	-On spot marching -Side-Step Toe Touches -Grapevine - Basic Step - Knee up - Air squats				
	Cooling down exe -Dynamic &static stretching.	10 min			

Friday 5:00pm-6:00pm	**warming up exercises:** For general and specific body.	10 min			
	Step aerobic dance exercises.	40 min	2*6 repetition for each	30 second for each rep	Moderate intensity 55-69 %
	-Knee rise				
	Walk and kick				
	-Basic step				
	-V step				
	-Box step				
	-Buttock kick				
	-Air squat				
	- turn step				
	-Step touch				
	-kick box				
	- Jumping jack				
	-Squat				
	Cooling down exe. -Dynamic &static stretching.	10 min			

The above schedule was performed on January, 2020.

APPENDIX –G

Table 5: Third Month Training Schedule (February, 2020)

Days per week	Type of Exercise	Duration 60 min	Sets & Repetition		Intensity of exercise
Monday 5:00pm-6:00pm	**Warming up exercises**: For general and specific body.	7 min			
	Step aerobics exercises	46 min	2*8 repetition for each	1min rest for each set	High (vigorous) is ≥70%
	-Hip role				
	-Air squats				
	-Box-step				
	-V step				
	-Basic-step				
	- turn step				
	-Step touch				
	-kick box				

	- Jumping jack				
	-Squat				
	-walk and kick				
	-On spot marching				
	Cooling down exe -Dynamic &static stretching.	7 min			
Wednesday 5:00pm-6: 00pm Friday 5:00pm-6:00pm	**warming up exercises:** -For general and specific body	7 min			
	Step aerobic dance exercises	46min	2*8 repetition for each	1min for each set	High (vigorous) is ≥70%
	-Basic Step				
	-Step touch				
	- Box Step				
	- V step				
	-kick box				
	- Jumping jack				
	-Air squats				
	-walk and kick				
	Jumping jack				
	-On spot marching -Side-Step Toe Touches -Graven				
	warming up exercises: -For general and specific body.	7 min			
	Step aerobic dance exercises	46 min	2*8 repetition for each	1min for each set	High (vigorous) is ≥70%
	-kick box				
	- Jumping jack				
	-On spot marching -Side-Step Toe Touches -Grapevine - Basic Step - Knee up - Air squats				
	- turn step				
	-Step touch				
	-Basic step				
	-V step				
	Cooling down exercise - Dynamic &static stretching	7 min			

The above schedule was performed in February, 2020

APPENDIX -H

Table 6: Raw data's for the selected motor fitness variables of experimental group

Target group code	Age	Agility (IAT in sec		Flexibility (SRT in cm		Static Balance (SBST, sec)	
		PT	PoT	PT	PoT	PT	PoT
tg1	21	23.59	23.56	22	24	21	21
tg2	21	23	22.58	23	24	29	31
tg3	22	21	21	21	24	26	32
tg4	19	23	22.58	20	22	25	30
tg5	23	21.5	21.48	19	24	24	28
tg6	21	18.58	18.55	18	22	20	22
tg7	20	21	20.58	21	24	27	28
tg8	20	24	23.57	20	23	29	33
tg9	19	23.52	23.49	22	24	27	29
tg10	24	21.5	21.45	20	23	25	26
tg11	20	23.59	23.57	21	24	20	25
tg12	21	20	19.59	18	22	20	23
tg13	19	23.58	23.55	20	23	22	25
tg14	22	22.5	22.51	21	24	20	21
tg15	19	24	23.57	20	22	21	25
tg16	20	22.45	22.45	19	24	28	32
tg17	19	22.32	22.21	18	20	26	31
tg18	22	20.36	20.37	17	20	22	24
tg19	19	23.16	23.15	21	24	20	22
tg20	20	21.15	21.15	20	23	25	30

APPENDIX -I

Table 7: Raw data's for the selected motor fitness variables of control group

Target group code	Age	Agility (IAT in sec		Flexibility (SRT in cm		Static Balance (SBST, sec)	
		PT	PoT	PT	PoT	PT	PoT
tg1	19	24.01	24	20	20	19	18
tg2	22	23.15	23.14	21	21	19	19
tg3	21	22	22	17	18	22	22
tg4	20	24	24	20	21	21	22
tg5	22	21.15	21.14	17	16	25	25
tg6	21	24.01	23.59	20	21	20	20
tg7	19	18.12	18.13	21	21	20	19
tg8	21	24	24	18	19	20	19
tg9	20	22.52	22.52	21	22	20	20
tg10	23	22	22	19	18	25	25
tg11	24	21	21.03	21	21	23	23
tg12	20	20	20	17	17	21	23
tg13	24	23.53	23.53	21	20	25	27
tg14	23	24	24.03	20	19	19	19
tg15	19	21	21.01	19	20	18	18
tg16	20	19	19.01	18	19	25	25
tg17	20	23	23	23	24	24	24
tg18	21	24	24	18	19	24	25
tg19	20	25	25	22	22	21	22
tg20	19	18	17.59	19	18	21	21

APPENDIX - J

Table 8: Paired sample T-test results of the Illinois agility test for the experimental group (pre to post test result)

Parameters	Mean value	Paired Differences					T	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	22.19-22.048	.14200	.18961	.04240	.05326	.23074	3.349	19	.003

APPENDIX -K

Table 9: Paired sample T-test results of the Illinois agility test for Control group (pre to post test result)

Parameters	Mean value	Paired Differences					t	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	22.1745-22.14	.03850	.12922	.02889	-.02198	.09898	1.332	19	.198

APPENDIX -L

Table 10: Paired sample T-test results of the Sit and reach test for experimental group (pre to post test result)

Parameters	Mean value	Paired Differences					t	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	20.05-23.00	-2.95000	.99868	.22331	-3.41740	-2.48260	-13.210	19	.000

APPENDIX -M

Table 11: Paired sample T-test results of the Sit and reach test for the control group (pre to post test result)

Parameters	Mean value	Paired Differences					t	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	19.6-19.8	-.20000	.83351	.18638	-.59009	.19009	-1.073	19	.297

APPENDIX -N

Table 12: Paired sample T-test results of the Stand balance stork test (Pre to post test result) for experimental group

Parameters	Mean value	Paired Differences					t	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	23.85-26.9	-3.05000	1.70062	.38027	-3.84591	-2.25409	-8.021	19	.000

APPENDIX -O

Table 13: Paired sample T-test results of the Stand balance stork test (Pre to post test result) for the control group

Parameters	Mean value	Paired Differences					T	df	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
PT-PoT	21.6-21.8	-.20000	.83351	.18638	-.59009	.19009	-1.073	19	.297

APPENDIX - P

Fitness Norms: The norm charts included in this appendix are a representation of how individuals compare to others with regard to performance on the physical fitness tests. The Cooper Institute has one of the largest and most valid data bases in the world with respect to fitness norms.

There are two types of norms that the Coast Guard uses for fitness testing:

1. Age and Gender Norms. Age and gender norms are a representation of how individuals in a specific age and gender group compare to one another with regard to performance on physical fitness tests. Age and gender norms are acceptable for use in all Coast Guard fitness tests unless specified by the specific unit instruction.

2. Absolute Norms. Absolute norms are minimal scores or "cut-points" that have been determined in law enforcement validation studies as the fitness standard that must be attained by everyone regardless of age, gender, or handicapping conditions for the person to be considered fit for duty. Absolute norm tables are not depicted in this appendix but can be found in the manuals that require absolute norm standards.

Table 14: Normative data of agility test (Illinois agility test) in second

Sex	Excellent	Good	Fair	Poor
Female	< 17.0	17.0-17.9	18.0-21.7	>23.0

***Source**: Roozen, 2004*

APPENDIX -Q

Table 15: Normative data of the flexibility test (sit and reach test) in cm

Age 19-24	Excellent	Above average	Average	Below average	Poor
Sex (Female)	24	21-22	19-20	17-18	<15

***Source:** ACSM (American College of Sports Medicine). 2014*

APPENDIX -R

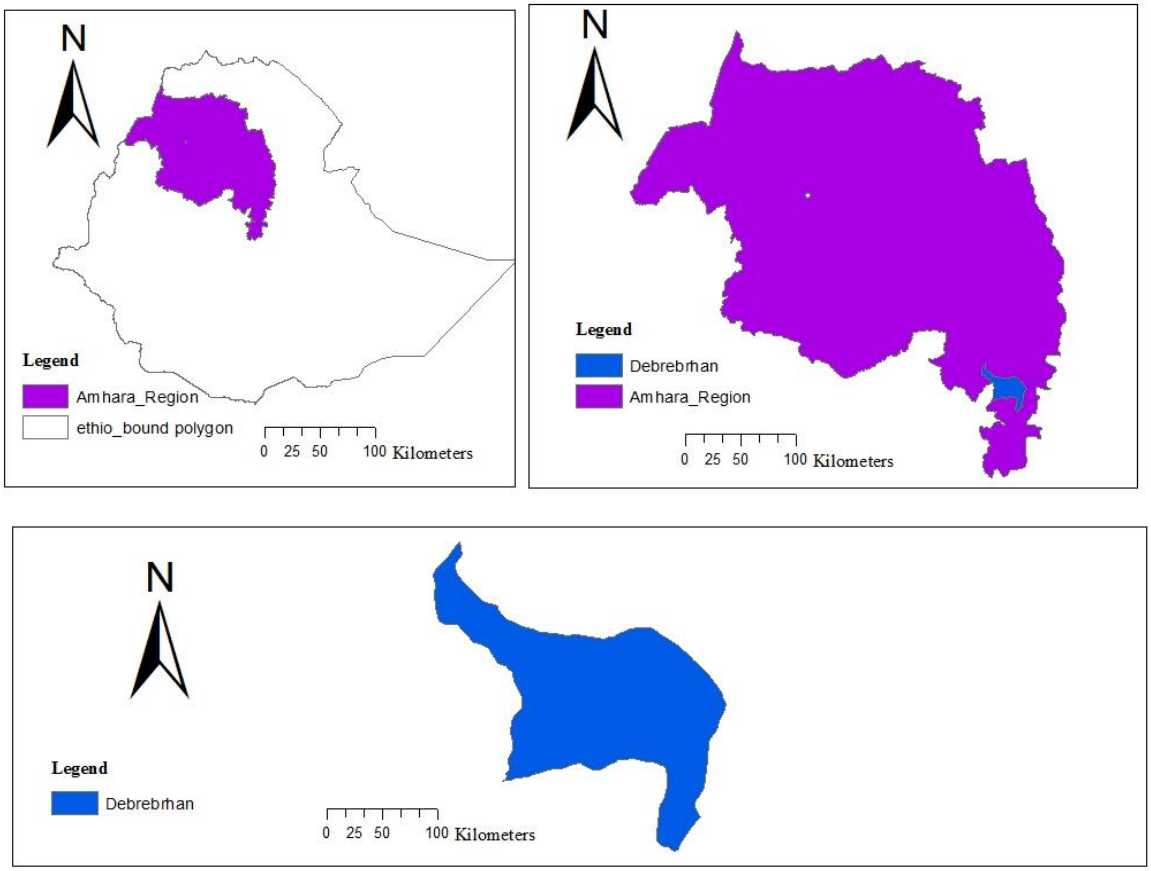
Table 16: Normative data of balance test (stork balance stand test) in second

Sex	Excellent	Above average	Average	Below average	Poor
Female	<27	23-27	8-22	3-7	<3

***Source**: Schell, J and Leelarthaep in 1994*

APPENDIX: S

Figure 1: Map of the study site



Source: - https://images.search.yahoo.com/yhs/search?p=map+of+debre+berhan+amhara+region+Ethiopia&fr=yhs-aztec