ASSESSMENT OF AEROBIC DANCE EXERCISE AS MEDICINE ON THE AEROBIC CAPACITY OF OVERWEIGHT YOUNG GIRLS IN BENUE STATE UNIVERSITY, MAKURDI, NIGERIA

By

[1]SHACHIA T. T,[2]ADI,D, and [2]BALOGUN, J. N.

Corresponding Author e-mail:shachiaterfa@gmail.com

[1]School of Science Education, Department of Physical and Health Education.,Adigrace College of Education Byepyi,, Wukari, Taraba State.

[2]Faculty of Education, Federal University, Wukari, Department of Physical and Health Education.

Abstract

This study examined the effect of aerobic dance exercise as medicine on the aerobic capacity (VO_2max) of overweight young girls in Benue State University, Makurdi, using a pretest-posttest control group, thirty-seven (37) participants were randomly assigned into either control group (n=19) or experimental group (n=18). The experimental group performed aerobic dance training three (3) times in a week for eight (8) weeks at moderate – high intensity levels while the control group did not take any form of training. VO_2max was measured before and after the aerobic dance exercise using Cooper 12-minute run/walk test. The data collected were analysed using descriptive statistics of mean and standard deviation to describe the physical characteristics of participants while the hypothesis was tested using student's independent t-test at significant level of 0.05,the data were analysed through statistical package for the social sciences (SPSS) for windows version 25. The results of this study revealed that eight (8) weeks of aerobic dance had a significant increase($p = 0.001$) on VO_2max of overweight young girls in Makurdi. Nigeria. Based on the findings of this study, the researcher concluded that participation in eight (8) weeks of aerobic dance significantly improved the aerobic capacity of overweight young girls in Makurdi, Nigeria and recommended that, overweight girls should regularly engage in aerobic dance to increase their aerobic capacity.

Keywords: Aerobic dance, Aerobic capacity (VO_2max), Medicine and Overweight.

Introduction

Maximum aerobic capacity (VO_2max) is the highest rate at which the body muscles can produce ATP-PC aerobically during exercise Keteyian, Brawner, Savage, Ehrman, Schairer, Divine, Aldred, Ophaug, and Ades, (2019) maintained that it is the upper limit at which the cardiovascular system can deliver oxygen-enriched blood to the working muscles of the body. Thus VO_2max is not only a good index of cardio-respiratory fitness and health but also a good predictor of performance capability in most endurance related activities.

The efficacy of using oxygen is termed aerobic capacity (Guedes & Guedes, 2017). Regular aerobic exercise increases the body's ability to use oxygen. When an individual's aerobic capacity is high, the heart, lungs and blood vessels efficiently transport and

deliver large amounts of oxygen throughout the body(Keteyian, et al, 2019).Over the past 30 years maximal aerobic capacity (VO2max) has emerged as a strong predictor of adverse health outcomes such as cardiovascular and respiratory disease such as high blood pressure, type2 Diabetes(Cruz-Martínez, Rojas-Valencia, Correa-Mesa, & Correa-Morales, 2018). Exercise is an effective medicine for achieving improvements in aerobic capacity, with a rise of one metabolic equivalent in VO2max associated with a 10 % -25% improvement in survival (Kaminsky, Arena, Beckie, Brubaker, Church, Forman, Franklin, Gulati, Lavie, & Myers, 2018). Thus, aerobic exercise represents a potentially important preventative approach to reduce the risk of disease development in healthy individuals, low aerobic fitness has also been related to an increased risk of various forms of cardiovascular diseases (Guedes & Guedes, 2017).Therefore, it is not surprising that a large proportion (up to 75%) of overweight and obasedfemale have some forms of cardiovascular diseases (Lakka, Laukkanen, Rauramaa, Salonen, Lakka, Kaplan, & Salonen, 2019).

Given the potentially adverse health consequences of poor aerobic capacity in overweight females, considering the fact that the population of Nigeria is dominated by females of school age, Specifically, Benue state, a rich carbohydrate crops producing state with overweight female populace who are vulnerable to overweight and obesity complication, the researcher wishes to assess the specificity of aerobic dance exercise as medicine on the aerobic capacity of overweight young girls in Benue State University, Makurdi.

Aerobic dance exercise programmes have been shown to increase aerobic capacity and endurance, reduce pain, improve functionality and quality of life (Kaminsky et al., 2013). Aerobic dance involves regular body part such as arms or legs movements and increase workload on the cardiovascular and cardiorespiratory systems thus improving the level of VO2max (Farrokhi, Baker, & Fitzgerald, 2016).

The inherent advantages of Aerobic dance exercise stem from an increase in the cardiac output and an enhancement of the innate ability of muscles to extract and to utilize oxygen from the blood. This benefit is further compounded by the benefit physical exercise has on the body fat patterns (Patel, Alkhawam, Madanieh, Shah, Kosmas, & Vittorio, 2017).

Research Questions:
Would participation in aerobic dance for eight (8) weeks thrice per week on alternate days modify the aerobic capacity(VO2max) of overweight young girls in Benue State University, Makurdi?

Hypotheses
There is no significant effect of aerobic dance on the VO2max of overweight young girls in Benue State University, Makurdi, Nigeria.

Methodology
The experimental research design of pretest-posttest control group was used in this study. The population for this study was 10,898 undergraduate female students of Benue State

University, Makurdi (Matriculation brochure, 2018/2019). A simple random sampling technique was used in selecting six (6) Faculties from the 8 existing faculties of the University. A purposive sampling technique was further used to select seven (7) overweight young girls, between the ages of 15 and 25 years from each of the selected Faculties. They were randomly assigned into either control (21) or experimental group (21), four (4) were dropped as a result of inconsistency in training attendance and one (1) dropped as a result of ill health. Therefore, data was collected on 19 control and 18 experimental group participants. Thus, thirty-seven (37) participants were used for this study. The experimental group performed aerobic dance training three (3) times in a week for eight (8) weeks while the control group did not take any form of training. VO2max was measured using Cooper 12-minute run/walk test before and after the aerobic dance exercise. The data collected was analysed using descriptive statistics of mean and standard deviation to describe the physical characteristics of participants and the hypothesis was tested using student's independent t-test at significant level of 0.05, through statistical package for the social sciences (SPSS) for windows version 25.

Criteria for Inclusion

All the participants were screened and those who met the following criteria were selected for this study:

I. Participants were young girls schooling in Benue State University, Makurdi,
ii. The ages range was between 15 and 25 years.
iii. The BMI of the participants ranged between 25.0 kg/m2 and 29.9 kg/m2

Informed Consent Form

The selected participants for the study were adequately briefed on the procedures be taken during the programme the and commitments required of them. The informed consent form was administered to each participant to read and those who were consented for the study signed the consent column. Similarly, Physical Activity Readiness Questionnaire (PAR-Q) was used to screen participants for the study before commencement of the training programme to ensure that participants were fit to participate in a physical activity programme of aerobic dance.

Research Assistants

Seven female research assistants were used since the participants were female, they were trained by the researcher which enable them to assist the researcher in taking records of distance each participant covers during the 12 minutes run/walk test.

Instruments

The following instruments were used for data collection:

I. Stadiometer (Model 220, SECA, Hamburg, Germany)
ii. A 400-meters standard track of Benue State University, Makurdi.
iii. Stop watch (Athletic stop watch TC 1020, made in China)
iv. Flexible measuring tape (made in China).

Maximal Oxygen Uptake (Vo2max)

The Cooper 12-minutes run/walk test conducted on a 400m standard track was used to determine the VO2max of the participants before and after 8 weeks of aerobic dance programme. Following the procedure prescribed by Lundberg, Fernandez-Gonzalo, Gustafsson, and Tesch (2016). The ACSM (2018) formula for predicting VO2max = Distance covered (meters) ÷ Time taken (minutes) X 0.2 + 3.5 (ml-1. Kg-1 Min-1) was used to convert distance covered into each participant's measure of Vo2max.

Aerobic Dance Programme

Aerobic dance is a popular means of exercise regimen, performed especially in a group exercise setting to music. Each participant does aerobic dance for personal reasons such as to improve health, lose weight, tone muscles, burn fat and improve quality of life (Jaywant, 2019).

For this study, the participants performed the aerobic dance in a group setting, the dance rhythm, pace and intensity was controlled by an aerobic dance instructor guided by the tempo of the music. Before the commencement of training programme, the participants performed a five-minute warm up of stretching and flexibility exercises on the spot in the Human Performance Laboratory of the Department of Human Kinetics and Health Education, Benue State University, Makurdi. This was done to prepare the body system for the physical exertion so as to prevent musculoskeletal injuries during the exercise programme (American College of Sports Medcine (ACSM), 2019). Following the warm-up, the participants started aerobic dance training under the supervision of the researcher and research assistants. The participants were allowed to have 2 minutes' rest of slow walking on the spot in between the training session to prevent buildup of lactic acid, which cause fatigue and muscle soreness. However, the trainings were altered depending on the rate of perceived physical exertion (RPE) of the participants using the modified Borg Scale. The scale rates from 6-20; where 6 stands for no exertion at all while 20 stands for maximal exertion in order to permit optimal adaptation to the aerobic dance.

During the first two week of training, participants began the programme with 5 minutes warm up after which they danced for 20 minutes at 50-55% intensity (HR max) and cooled down for 5 minutes. During the 3rd-5th week, the participants began the programme with 5 minutes warm up after which they perform the aerobic dance for 25 minutes at 60-65% intensity (HR max) and cooled down for 5 minutes. The last session (6th-8th week), the participants began the programme with 5 minutes warm up after which they perform aerobic dance for 30 minutes at 70-75% intensity (HR max) and cooled down for 5 minutes. This was determined by the Tanaka formula of 208 - (0.7 x age) = Max Heart Rate, multiply by the intended exercise intensity, adopted from (Cruz-Martínez,et al, 2018). Similarly, all post-training programme measurements were taken at 8th week.

Training Schedule

Table 1. Showing Training Schedule

Week	Warm up Duration	Training Duration	Intensity (HRmax)	RPE	Cool down	Total Duration
1st - 2nd week	5 minutes	20 minutes	50% - 55%	6 – 8 **No Exertion**	5 minutes	30 minutes
3rd- 4th week	5 minutes	25 minutes	60% - 65%	9-11 **Light**	5 minutes	35 minutes
5th - 6th week	5 minutes	30 minutes	70% - 75%	12 -14 **Somewhat hard**	5 minutes	40 minutes
7th - 8th week	5 minutes	35 minutes	80% - 85%	13 -14 **Hard**	5 minutes	45 minutes

Adapted from Jaywant, (2019).

Procedure for Data Analysis

I. Descriptive statistics of mean and standard deviation was used to describe the physical characteristics of participants.

ii. The student t-test for independent sample was used to find significant difference between Pretest and Posttest data of the groups.

iii. An alpha level of 0.05 was be used to retain or reject the hypotheses that were raised for this study.

Results

The data collected were statistically analysed and the results were discussed and presented as follows; Data were collected on 19 control and 18 experimental participants. Thus, thirty-seven (37) participants were used for this study. The data collected at pre-tests and posttests were analysed through Statistical Package for Social Sciences (SPSS) for windows version 25, (SPSS Inc., Chicago IL, USA).

Physical Characteristics of participants

Table 2.below shows the physical characteristics of all the participants before the commencement of training in the control and experimental groups.

	Control Group n = 19		Experimental Group n = 18	
Variables	Mean	SD	Mean	SD
Age	21.10	3.34	20.38	2.87
Height (m)	1.59	0.02	1.59	0.02
Weight (kg)	70.00	3.45	70.16	2.22

Table 2.shows that, before the commencement of the training, the mean age, of the control group was 21.10 ± 3.34 years with the mean height and weight of 1.59 ± 0.02m and 70.00±3.45kg respectively, while the mean age of the experimental group was 20.38±2.87 years with the mean height and weight of 1.59±0.02m and 70.16±2.22kg respectively.

Hypothesis:
There is no significant effect of aerobic dance on VO_2max of young girls in Benue State University, Makurdi, Nigeria.

Table 3. Independent t-test analysis on the effect of aerobic dance on VO_2max of overweight young girls.

Variable	Group	N	Mean (ml/min/kg)	SD	DF	t	p
	Control	19	23.37	0.72			
VO_2max					35	-8.79	0.001
	Experiment	18	26.11	1.13			

Table 3.Showed the t- test analysis of control and experimental group test effect of aerobic dance on the VO2max of overweight young girlsin Benue state University, Makurdi, Nigeria. An observation of this result revealed that 8 weeks aerobic dance had statistical significant improvement on the VO2max of overweight young girls in Benue State University, Makurdi (p=0.001) therefore, the null hypothesis which states that there is no significant effect of effect of aerobic dance on VO2max of overweight young girls in Benue State University, Makurdi was rejected.

Discussions:
The results of this study revealed a significant improvement of aerobic dance on the VO2max of overweight young girls inBenue State University, Makurdi (p = 0.001). Mukherjee, Banerjee, and Chatterjee (2019) conducted a similar study to assess the effect of aerobic dance training on VO2max and other physiological parameters in overweight young adult females, where thirty (30) sedentary overweight young adult females between 20-30 years of age group were used. Subjects participated in aerobic dance 3 days per week for 8 weeks. VO2max was calculated by Queens College step test, using a pretest posttest research design. The findings revealed that there was a significant difference between the pretest and posttest measurement (P=0.000). Mukherjee et al. (2019) study was supported by the finding of this present study. Cord and Calvert (2016) who also examined the training effect of a 12 weeks low impact aerobics dance programme on aerobic capacity of 16 sedentary college aged overweight females and observed a significant 7.62% increase in relative VO2max and a 5.2% increase in absolute VO2max. It can be concluded that moderate-impact dance aerobics for 8 weeks is effective in producing VO2max improvement.

Mustedanagic, Bratic, Milanovic, and Pantelic (2017) investigated the effect of aerobic exercise programme on the cardiorespiratory fitness and body composition of female

college students. In their study, fifty (50) healthy overweight college girls 22.28±1.83 years, voluntarily took part in the study. They were randomly assigned into an experimental group (n=25 and BMI=33.11±5.32 kg.m-2) and control group (n=25 and BMI=33.64±3.12 kg.m-2). The exercising group participated in aerobic dance for 60 minutes, 3 times per week for 8 weeks. The pre and post-test in VO2max were measured for both groups via Bleep test. There was a significant (p=0.001) difference in VO2max between the exercising group and the control group. This study indicates that aerobic dance is an effective intervention to enhance aerobic capacity among overweight young girls.

Similarly, Wallman, Plant, Rakimov, and Maiorana (2018) assessed the effect of 8-week aerobic training intervention on aerobic capacity, android and gynoid fat mass, and blood lipids in overweight college girls and reported a significant effect of the aerobic dance training on the VO2max (p = 0.000) using a pretest posttest research design.

Effect of Aerobic Dance on Aerobic Capacity of Overweight Females

Aerobic dance exercise programmes have been shown to increase aerobic capacity and endurance, reduce pain, improve functionality and quality of life (Kaminsky et al., 2018). Aerobic dance involves regular body part such as arms or legs movements and increase workload on the cardiovascular and cardiorespiratory systems thus improving the level of VO2max (Farrokhi, et al, 2016).

The inherent advantages of physical exercise stem from an increase in the cardiac output and an enhancement of the innate ability of muscles to extract and to utilize oxygen from the blood. This benefit is further compounded by the benefit physical exercise has on the body fat patterns (Patel, et al, 2017). Aerobic exercises include cycling, dancing, hiking, jogging/long distance running, swimming and walking can best be accessed via the participants aerobic capacity, which is defined by the ACSM as the product of the capacity of the cardiorespiratory system to supply oxygen and the capacity of the skeletal muscles to utilize oxygen (ACSM, 2018). The criterion measure for aerobic capacity is the VO2max, which can be measured either through graded exercise ergometer or treadmill protocols with an oxygen consumption analyser or via mathematical formulas.

Conclusion

Based on the results of this study, it was concluded that participation in eight (8) weeks aerobic dance had a significant increase on the aerobic capacity of overweight young girls in Benue State University, Makurdi.

Recommendation:

Overweight young girls should regularly engage in aerobic dance thrice per week at moderate to high intensity levels as an exercise medicine to improve their Vo2max.

References:

American College of Sports Medicine. (2019). The course for the executuion of different mode of exercises: A change to active life style. *ACSM's Health and Fitness Journal, 18*(9), 25-31. doi: 11.1517/22

American College of Sports Medcine. (2018). Group exercise instruction: More than aerobic dance. *ACSM's Health and Fitness Journal, 19*(6), 34-35. doi: 10.1249/10

Cord , A. E., & Calvert, S. L. (2016). Effects of a 12 weeks low impact aerobics dance programme on aerobic capacity of sedentary college-aged overweight females. *Child development perspectives, 5*(2), 93-98.

Cruz-Martínez, L. E., Rojas-Valencia, J. T., Correa-Mesa, J. F., & Correa-Morales, C. (2018). Maximum Heart Rate during exercise: Reliability of the 220-age and Tanaka formulas in healthy young people at a moderate elevation. *Revista de la Facultad de Medicina, 62*(4), 579-585.

Farrokhi, S., Baker, N. A., & Fitzgerald, G. K. (2016). Principles of rehabilitation: Physical and occupational therapy *Rheumatology* (pp. 375-381): Elsevier.

Guedes, D. P., & Guedes, J. E. R. P. (2017). Physical activity, cardiorespiratory fitness, dietary content, and risk factors that cause a predisposition towards cardiovascular disease. *Arquivos brasileiros de cardiologia, 77*(3), 251-257

Jaywant, P. (2019). Effect of aerobic dance on the body fat distribution and cardiovascular endurance in middle aged women. *Journal of Exercise Science and Physiotherapy, 9*(1), 6.

Kaminsky, L. A., Arena, R., Beckie, T. M., Brubaker, P. H., Church, T. S., Forman, D. E., Myers, J. (2018). The importance of cardiorespiratory fitness in the United States: the need for a national registry: a policy statement from the American Heart Association. *Circulation, 127*(5), 652-662.

Keteyian, S. J., Brawner, C. A., Savage, P. D., Ehrman, J. K., Schairer, J., Divine, G., Ades, P. A. (2019). Peak aerobic capacity predicts prognosis in patients with coronary heart disease. *American Heart Journal, 156*(2), 292-300.

Lakka, T. A., Laukkanen, J. A., Rauramaa, R., Salonen, R., Lakka, H.-M., Kaplan, G. A., & Salonen, J. T. (2019). Cardiorespiratory fitness and the progression of carotid atherosclerosis in middle-aged men. *Annals of Internal Medicine, 134*(1), 12-20.

Lundberg, T. R., Fernandez-Gonzalo, R., Gustafsson, T., & Tesch, P. A. (2016). Aerobic exercise alters skeletal muscle molecular responses to resistance exercise. *Medicine & Science in Sports & Exercise, 44*(9), 1680-1688.

Matriculation brochure (2018/2019). Benue State university students record. *Document of the Benue State university accademic office*7-10.

Mukherjee, S., Banerjee, N., & Chatterjee, S. (2019). Effect of aerobic dancing on body composition and physical fitness status of overweight young adult females.International Journal of Morphology 31(4):1243-1250

Mustedanagic, J., Bratic, M., Milanovic, Z., & Pantelic, S. D. (2017). The effect of aerobic exercise program on the cardiorespiratory fitness and body composition of female college students. *Facta Universitatis, Series: Physical Education and Sport*, 145-

158.

Myers, J., Prakash, M., Froelicher, V., Do, D., Partington, S., & Atwood, J. E. (2020). Exercise capacity and mortality among men referred for exercise testing. *New England Journal of Medicine, 346*(11), 793-801.

Patel, H., Alkhawam, H., Madanieh, R., Shah, N., Kosmas, C. E., & Vittorio, T. J. (2017). Aerobic vs anaerobic exercise training effects on the cardiovascular system. *World Journal of Cardiology, 9*(2), 134.

Wallman, K., Plant, L. A., Rakimov, B., & Maiorana, A. J. (2018). The effects of aerobic dance exercise on aerobic fitness and fat mass in an overweight population. *Research in Sports Medicine, 17*(3), 156-170.