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Aerobic Dance Exercise and Its Effect on Cardio Respiratory Variables and Body Composition of Obese Youth and Adolescents in College of Education Ila- Orangun, Nigeria

Racheal Bolanle Ajala
Lecturer, Department of Physical and Health Education,
Osun State College of Education, Ila-Orangun, Nigeria
Kabiru Isola Adedokun
Lecturer, Department of Physiology, College of Health Sciences,
Osun State University, Osogbo, Nigeria
Oluwakemi Christiana Adedeji
Head, Department of Biology, Osun State College of Education, Ila-Orangun, Nigeria
Oluwasogo Ruth Ojo
Director, Department of Sports Unit, Wesley University, Ondo, Nigeria

Abstract:
Obese female youth show less participation in physical exercise and physical education programmes. This had led to poor conditions among them and justifies the need for them to engage in aerobic dance training. With obesity, numerous complications such as high blood pressure increase in heart rate and body mass index may arise. A structured exercise performed rhythmically to the tune of music to reduce these complications due to Aerobic dance exercise (ADE) of obese female youth in College of education Ila- orangun have been well reported. One hundred and seventy-two (172) obese female youth were recruited from five schools within the college. The subjects were randomized into intervention group which participated in 12-week Aerobic Dance Exercises and the control group did not engage in an organized training. Heart rate, systolic blood pressure, diastolic blood pressure, body weight and body mass index were measured before and after training. Instrument used were sphygmomanometer, stethoscope, skinfold caliper, stadiometer, weighing scale and heart rate monitor. Descriptive statistics and inferential statistics Analysis of covariance at 0.05 were used in analyzing the data. There were significant effects of treatment on body weight ($F_{(1,165)}$=10.877;P< 0.05 η^2=0.037), percent body fat ($F_{(1,165)}$= 12.379; P< 0.05 η^2=0.105); resting heart rate ($F_{(1,165)}$=15.638; P< 0.05 η^2=0.056); systolic blood pressure ($F_{(1,165)}$=14.486;P<0.05 η^2=0.016); diastolic blood pressure ($F_{(1,165)}$=5.375; P<0.005 η^2=0.050) respectively. Aerobic dance exercise is capable of lessening high blood pressure, heart rate and body mass index associated with obesity, hence it should be included in the school curriculum.

Keywords: *Obesity, aerobic dance exercise, heart rate, blood pressure, body weight, percent body fat*

1. Introduction

Obesity and overweight are judged in relation to body mass index (BMI), although it is an excessive amount of body fat relative to body weight (Heyward, 2002). When body mass index (BMI) is between 25kg/m^2 and 29.9kg/m^2, it is said to be overweight. While obesity is defined as BMI of 30kg/m^2 or more and underweight is defined as BMI of less than 18.5kg/m^2 poly saturated fatty acids has being incriminated on a major problem in obesity and overweight, causing less functional activity of major body organs such as the heart, kidney, the liver and so on. Uncontrolled obesity would generate hypertension, diabetes, hypercholesterolemia, gall bladder stone, certain cancer, type II diabetes and early death, American College of Sports Medicine (ACSM, 2002). It is for this reasons that various studies on obesity and related issues are of interest to exercise physiologist in an attempt to finding solutions to the problems. Obesity can be subdivided into android and gynoid obesity (Hayward, 2002). In Android, excessive body fats are located in the upper extremities and in gynoid, fats are mainly distributed in the upper body. Most often, distribution of fat in the body determines the associated diseases (Ojo &Babalola, 2018).

Aerobic dance exercise (ADE) is a form of physical exercise that depends solely on the aerobic energy system. In other to meet energy demands during exercise through aerobic metabolism, oxygen relatively required (Ajayi, Abayomi and Ojo, 2013). In designing a training programme, it is important to consider the principles of training in other to know the extent at which the exercise can be performed, be it low or moderate (Babalola& Ojo, 2015). The intensity of the exercise could be between 60% and 80% of maximum heart rate. Through ADE, the hearts, lungs and muscle groups performed efficiently as well as improving the body and mind. The development, improvement and maintenance of human physical functioning have been a primary goal of physical education programme of which aerobic dance exercise is an

integral part. This is because the physiological efficiency of the body is a very significant aspect of human life (Howley, 2014). Through regular physical activity, the health and well-being of people, mobility and body functioning would improve and there would be optimum health.

Two factors; nature and nurture have always been linked with body weight. These are inheritance on one hand and excessive diet and lack of exercises on the other. Payne and Hayne, (2001) stated that the ectomorph body type, a tall slander body seems to virtually protect the individual from excessive weight difficulty and usually have difficulty maintaining normal weight for their height. The mesomorph represents a genetic middle ground body type with shorter heavily muscles to be able to maintain good body built while at young age but become obese while at adult with less activity. The endomorphs have body that is around and soft with excessively large abdomen and usually have weight problem since childhood. However, because of the chronological nature of obesity, it has become necessary to evaluate the prevalence of obesity of undergraduate students so as to guide against full blown development in adulthood. This study will act as a guide on the health education of Nigerians against overweight, obesity and its consequences.

In children and youth, the trend of obesity is on the rise in developed and developing countries (Pronk & Boucher, 1999). Much of youth obesity and physical inactivity have their roots in children through adolescence, a period characterized by marked changes in both body and behavioral changes (Ogunleye, 2011). Supportively, youth fitness data showed that youth are becoming fatter and less aerobically fit (Goran, 2000). The World Heart Foundation believed that between 60 and 80% of larger population did not engage in physical activity sufficiently in other to achieve health benefit, especially among girls and women. Possible causes of increased prevalence of obesity among obese female youths are modernization, rapid urbanization in developing countries and unsafe environment.

Modern inventions have positively changed the way some activities are carried out. Ironically, they have also contributed to sedentary lifestyle in a large segment of the population (Underhay, de Ridder, Van Rooyen& Kruger, 2002). Youth prefers to spend their leisure in screen-based activities like engaging in television watching, reading and computer games. Ogunleye and Ojo (2019) had stated that physical exercises of aerobic types are of immense benefit to humans as they contribute to the effective functioning of the brain in several dimensions including molecular and the behavioural traits. Aerobic dance exercise has been shown to reduce body fat thereby contributing to a loss of body weight treat and prevent obesity and positively enhance total fitness (Emiola, et. al, 2002, Hoeger & Hoeger, 2005; McGlynn, 1999). Therefore, this study investigated the effects of aerobic dance exercise on cardiorespiratory variables and body composition of obese youth and adolescent in the College of Education.

1.1. Hypotheses

This study tested the following hypotheses:

- There would be no significant effect of treatment on body weight of obese youth and adolescents of College of Education Ila-Orangun.
- There would be no significant effect of treatment on percent body fat of obese youth and adolescent of College of Education Ila-Orangun.
- Treatment would not have significant effect on resting heart rate of obese youth and adolescents of College of Education Ila-Orangun.
- Treatment would not have significant effect on systolic blood pressure of obese youth and adolescent of College of Education Ila-Orangun.
- There would be no significant effect of treatment on diastolic blood pressure of obese youth and adolescent of College of Education Ila-Orangun.

2. Materials and Methods

Heights and weights of each participant were taken using digital stadiometer (Charder HM 210D) and weighing scale (TCS-JL18) respectively. Participants' SBP, DBP and RHR were measured as described by Musa et al. (2002), using an automated digital electronic Blood pressure monitor in a sitting position after each participant would have rested for at least five minutes. The participants weight in kilogrammes, height in meters and BMI in kilogramme per meter square. All measurements were recorded before and after ADE training.

This study was conducted amongst obese female youth of College of Education, Ila-Orangun in Osun State. One hundred and seventy-two (172) female obese youth were recruited from five schools within the college. pretest-posttest control group experimental research design which involves randomization along Ogunleye (2015) application template was adopted. It involved a careful measurement (pretest) of the participants which was made before treatment was given and subsequently another measurement (posttest) was made after 12-week of treatment. The observed difference between the two measurements was recorded. Through purposive sampling technique, the participants having high level of obesity and without any medical report contra-indicating exercise participation were selected. The participants were encouraged not to engage in any exercise programme few weeks before, during and after their participation in the study. They all completed a physical activity readiness questionnaire to participate in the exercise. Eighty-six participants were assigned to intervention and control group each as indicated in Figure I.

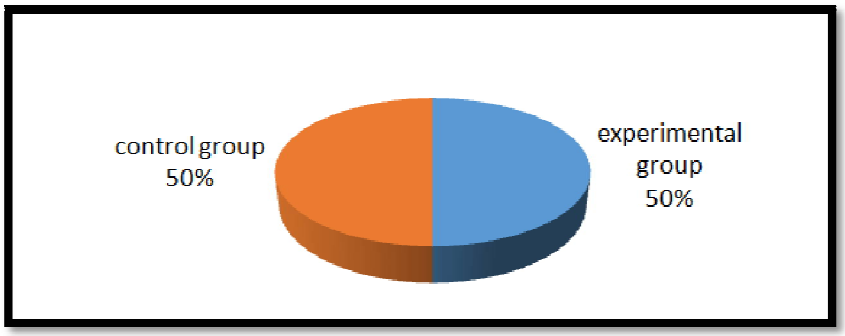

Figure 1: Pie Chart Showing the Distribution of the Respondents by Groups

The Aerobic Dance Exercise Protocol began with the researcher explaining into details the nature, focus and benefits of the test to participants before the commencement of the training. They were also given informed consent form which they completed, signed and returned to the researcher. The training programme was a continuous low to moderate impact of aerobic type performed by Intervention group, while the control was placed on lifestyle placebo. The training programme lasted for 12 weeks. There were three sessions per week. The placements (days for training) were Tuesdays, Thursdays and Saturdays for the intervention group with music, while Mondays, Wednesdays and Fridays were for the control group without music. Each training session for the intervention group was made up of three segments. This included calisthenics, conditioning bout or aerobic segment and cool down throughout the training regimen. Each of the sessions was conducted early morning (7:00am-8:00am). The session was in three segments for 30 minutes at a moderate intensity of between 60%-80% of their maximum heart rate. The starting workload was slow pace which was increased at a faster pace to obtain a HR max 60%. The initial exercise session was increased from 30 minutes in the first two weeks of training to 45 minutes which was maintained throughout the till the end of the training. The cool down session was included for each session of the training. Participants in the control group were instructed not to undertake any organized exercise during the 12-week period of the study. Table 1 shows the training programme for aerobic dance exercise.

Conditioning Bout and Exercise Modality	**Rhythm**	**Counts**	**Repetition per Weeks**					
			1-2	3-4	5-6	7-8	9-10	11-12
Back lunge	Slow	10	5	8	10	12	15	20
Grapevine	Slow	10	5	8	10	12	15	20
Lateral elbow lift	Slow	10	5	8	10	12	15	20
Triceps kick back	Moderate	15	5	8	10	12	15	20
Right leg side kick	Moderate	15	5	8	10	12	15	20
Left leg side kick	Moderate	15	5	8	10	12	15	20
Squats	High	25	5	8	10	12	15	20
Marching on the spot	High	25	5	8	10	12	15	20
Basal match	High	25	5	8	10	12	15	20

Table 1: Order for Aerobic Dance Exercise

Exercises such as back lunge, grapevine, lateral elbow lift, triceps kick back, right leg side kick, left leg side kick, squats, marching on the spot and basal match were put into dance steps starting from five repetitions and gradually into twenty repetitions. The treatment was administered for 12 weeks. The aerobic dance instructor led the exercise in which the participants watch and follow the procedure of changing formation. At the change of each rhythm and new exercise session the researcher demonstrated to lead the activities to be performed. The research assistant helped in monitoring activities carried out by each participant to ensure that they are properly guided. The aerobic dance exercise adopted the progressive workload approach so as to produce gradual overload work. All the activities were performed at a safe level of moderate-intensity between 50%-70% of age predicted MaxHR. The frequency was three times per week. The duration included the calisthenics (warm-up) period, conditioning bout (basic movement for aerobic dance) and cool down. There was sixty seconds water break in each session.

The study was subject to ethical consideration and subsequent approval from the Social Science and Humanities Research Ethics Committee (SSHREC) of the University of Ibadan. Informed consent form, physical fitness readiness questionnaire and hints on the nature and purpose of the training were provided to all participants before the commencement of the training. Participants who completed the informed consent form were used.

Data analysis involved descriptive statistics of mean and standard deviation and inferential statistics of Analysis of Covariance (ANCOVA) were used to present changes in BP and BMI in line with the prescriptive analyses of Adu, Ayeni and Ogunleye (1999), Adu and Ogunleye (2006) alongside with interpretation guidelines of Ogunleye (2008), was used at $p<0.05$.

3. Results

- Ho1: There would be no significant effect of treatment on body weight of obese youth and adolescents of College of Education Ila –Orangun.

Source	SS	df	MS	F-Ratio	Sig.	η^2
Corrected model	7109.252	1	7019.252	528.941	0.000	0.366
Treatment	433.033	1	433.033	10.877	0.000*	0.037
Explained	7493.177	6	1248.863	94.109	0.000	0.050
Residual	2189.614	165	13.270			
Total	9682.791	171	56.625			

Table 2: ANCOVA showing the Effect of Treatment on Body Weight (BW)

The result presented in the Table 2 showed that the treatment (ADE) had significant effect on body weight of the participants ($F_{(1,165)=}$ 10.877; P<0.05; η^2=0.037).The partial eta square of .037 indicated that the effect of the treatment was small on BW.

BW	Groups	Mean	Std. Error	Lowest	Highest
	Control	79.791	0.232	79.326	80.256

Table 3: Estimated Marginal Mean of BW

The mean score ($\bar{x}$ = 73.50) of the experimental group (EG) was smaller than the control group ($\bar{x}$ = 79.79). This means that with ADE, there was reduction in the BW of the participants in the EG while those in the control group (CG) had no changes in BW.

- Ho2: There would be no significant effect of treatment on percent body fat of obese youth and adolescents of College of Education Ila –Orangun.

Source	SS	df	MS	F-Ratio	Sig.	η^2
Corrected model	703.265	1	703.265	112.424	0.000	0.362
Treatment	239.059	1	239.059	12.379	0.000*	0.105
Explained	1400.550	6	233.425	37.315	0.000	0.016
Residual	1032.148	165	6.255			
Total	2432.698	172	14.226			

Table 4: ANCOVA showing the Effect of Treatment on % BF

The result presented in the Table 4 showed that the treatment (aerobic dance) had a significant effect on percent body fat of the participants ($F_{(1,165)=}$ 12.38; P< 0.05; η^2=0.105).The partial eta square of 0.105 indicated that the effect of the treatment was large on % BF.

% BF	Groups	Mean	Std. Error	Lowest	Highest
	Experimental	21.765	.413	20.939	22.592
	Control	26.896	.413	26.069	27.724

Table 5: Estimated Marginal Mean of Percent Body Fat

The mean value of the EG ($\bar{x}$ = 21.77) was smaller than that of control group ($\bar{x}$ = 26.90). There was decrease in pre-post percent body fat of the treatment group as against the constant value in the CG.

- Ho 3: Treatment would not have significant effect on resting heart rate (RHR) of obese youth and adolescents of College of Education Ila-Orangun.

Source	SS	df	MS	F-Ratio	Sig.	η^2
Corrected model	811.483	1	811.483	35.253	0.000	0.256
Treatment	534.964	1	534.964	15.638	0.000*	0.056
Explained	739.999	2	370.000	16.074	0.000	0.005
Residual	1718.035	6	286.339	12.439	0.000	0.007
Total	37988.128	165	23.019			
	5516.163	171	32.258			

Table 6: ANCOVA Showing the Effect of Treatment on RHR

The result presented in the Table 6 indicated that the treatment (aerobic dance) had a significant effect on RHR of the participants ($F_{(1,165)=}$15.638; P<0.05; η^2=0.056). The partial eta square of 0.056 indicated that the effect of the treatment was medium on RHR.

	Groups	Mean	Std. Error	Lowest	Highest
RHR	Experimental	75.939	0.353	75.231	76.647
	Control	84.172	0.354	83.464	84.881

Table 7: Estimated Marginal Means of RHR

The mean value ($\bar{x}$=75.939) of the EG was smaller than that of control ($\bar{x}$ = 84.172). This shows a decrease in pre-post RHR of the treatment group as against the increase evidence in the control group.

- Hypotheses 4: Treatment would not have significant effect on systolic blood pressure of obese youth and adolescent of Osun State College of Education Ila –Orangun.

Source	SS	df	MS	F-Ratio	Sig.	η^2
Corrected model	157.224	1	157.224	49.070	0.000	0.234
Treatment	139.247	1	139.247	14.486	0.000*	0.016
Explained	482.068	6	80.345	25.076	0.000	0.062
Residual	528.676	165	3.204			
Total	1010.744	171	5.911			

Table 8: ANCOVA Showing Effect of Treatment on Systolic Blood Pressure

The result presented in the Table 8 indicated that the treatment (aerobic dance) had a significant effect on SBP of the participants ($F_{(1,165)=}$14.49; *P*< 0.05; η^2=0.016). The partial eta square of 0.016 indicated that the effect of the treatment was large on SBP.

	Group	Mean	Std. Error	Lowest	Highest
SBP	Experimental	116.849	.567	115.712	117.985
	Control	125.548	.568	124.411	126.686

Table 9: Estimated Marginal Mean of SBP

The experimental mean score ($\bar{x}$=115.85) was lower than that of the control ($\bar{x}$=125.55) group. This means that those in the treatment class had a reduced SBP than those participants in the CG.

- Hypotheses 5: There would be no significant effect of treatment on diastolic blood pressure of obese youth and adolescents of Osun State College of Education Ila-Orangun.

Source	SS	df	Mean Squares	F-Ratio	Sig.	Eta.Sq.
Corrected model	8.102	1	8.102	1.882	0.172	0.014
Treatment	69.402	1	69.402	5.375	0.001*	0.030
Explained	345.502	6	57.584	13.379	0.000	0.234
Residual	710.173	165	4.304			
Total	1055.674	171	6.174			

Table 10: ANCOVA Showing the Effect of Treatment on Diastolic Blood Pressure

The result presented in the Table 10 indicated that the treatment (aerobic dance) was significant on DBP of the participants ($F_{(1,165)=}$5.375; *P*< 0.05; η^2=0.030).The partial eta square of 0.030 indicated that the effect of the treatment was large on DBP.

	Group	Mean	Std. Error	Lowest	Highest
DBP	Experimental	77.334	0.633	76.067	78.601
	Control	82.834	0.634	81.565	84.103

Table 11: Estimated Marginal Mean of DBP

The mean score ($\bar{x}$=77.334) of EG was lower than that of the mean score of the CG ($\bar{x}$=82.834). This means that with ADE the DBP of the participants in the EG reduces meaningfully.

4. Discussion

The significant reduction in body weight observed in this study is in line with Orbach (2008) who found out that physical activity contributes to a loss of body weight (WHO, 1999). The findings of Williams, et al and Wood (1990) equally showed that continuous aerobic exercise lasting over ten weeks reduces body weight significantly. The study of Emeghara (2001) showed a significant decrease in the body weight of cardiac patient after three months aerobic exercise. Also, Loss

(2002) reported that aerobic dance exercise has become gradually popular in fitness and weight loss programmes. The finding of this study showed that the total body weight of obese youth and adolescents who participated in aerobic dance exercise reduced at the end of the training.

Percent body fat significantly reduced in experimental group compared with the control group. This finding compared favorably with Pollock et al. (1992) who found a substantial decrease in %BF of young people who participated in aerobic fitness programme. It is also supported by Emeahara, (2001) who also found a major fall in %BF of cardiac patient after 3-months of aerobic exercise training. This significant reduction in percent body fat in this study may be attributed to the significant decrease in total body weight. Ojo and Babalola (2018) also reported large effect of resistance training on percent body fat of adolescents.

Finding from this study showed a significant reduction in resting heart rate in the experimental group compared to the CG. The position of Brook et al. (2004) who reported that aerobic dance training reduces RHR. SBP and DBP supported the findings. Kelley and Kelley (2000) observed that obese youth and adolescents who spent at least 45 minutes on regular, moderate to vigorous aerobic activity, at least three days in a week would experience reduction in weight, RHR, blood pressure and %BF. Furthermore, Babalola and Ojo (2015) detailed that there was utmost improvement in the RHR of University soccer players who are adolescents. Findings from this study revealed that aerobic dance exercise programme positively affects systolic blood pressure after 12-weeks of training. This is in line with Kelley and Kelley (2000) which showed indications that better result may be achieved after 10 weeks of resistance training for both systolic and diastolic blood pressure. In

Aerobic dance exercise programme significantly improved diastolic blood pressure after 12-weeks of training which is slightly contrary to the research evidence of Lurbeet. al. (2006) who reported that exercise has little or no effect on the likely changes related to diastolic blood pressure except in low humid environment whose slight changes are noted. There was increase in the control group while the reverse is the case in the experimental group within the period of the study. This confirms earlier submission that obese youth and adolescent are habitually prone to deteriorating health condition without exercise intervention. (Moses et al. 2014). This also corroborate scientifically presented arguments against sedentary lifestyle either as a relatively healthy individual or individuals with debilitating health conditions (Vanninen Booth, et al 2002: Venables & Jeukendrup, 2009: Kokkinos and Myers, 2010; James et-al,2014) Studies have shown significant decline in cardio respiratory parameter in exercise experimental group, although some programmes included diet classes, which may have an additional progressive effects (Maiorana, et al, 2002; Goldhaber- Friebert, et al, Kokkinos, 2014).

Based on the findings of this study, it was concluded that aerobic dance exercise programme significantly reduces body weight, percent body fat, resting heart rate, systolic blood pressure and diastolic blood pressure of participants. It was therefore recommended that, obese youths and adolescents should participate regularly in aerobic dance exercise to burn the body fat and improve cardio respiratory variables fitness so as avoid extravagate high blood pressure in later life. The low and moderate intensity associated with aerobic dance exercise contributes to the reduction of obesity with weight loss from fat, thus; its effectiveness in the development of good health. It was recommended that more specialized training aimed at improving cardio-respiratory fitness should be built into the training programme of participants.

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