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EFFECT OF AEROBIC DANCING PROGRAMME ON PHYSIOLOGICAL COMPONENTS OF FEMALE UNDERGRADUATE STUDENTS IN THE UNIVERSITY OF CALABAR

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ABSTRACT: *The study investigated the effects of the aerobics dancing programme (ADP) on the physiological components of female students at the University of Calabar. Three research questions were raised with their corresponding hypotheses. The Pretest-posttest quasi-experimental research design was adopted. The population was made up of 1226 female undergraduate students at the University of Calabar, out of which a sample of 60 was derived using a multistage sampling technique. The standardised instrument utilised in arriving at the collation of data was a digital sphygmomanometer for the measurement of resting heart rate (RHR), resting systolic blood pressure (RSBP), and resting diastolic blood pressure (RDBP), respectively. Research questions raised were answered using mean while the hypotheses were tested using the normalised gain analysis <g>. The results indicate that there is a significant reduction in the RHR (<g>=0.14), RSBP (<g>=0.08), and RDBP (<g>=0.12). It is concluded that aerobic dance performed 30–45 min, 3 days · week $^{-1}$ for 2 weeks with music of high tempo of 132-140bpm metronome beat significantly improves physiological functions of students, although to a low normalised gain. Based on the results obtained, it is recommended that ADP should be incorporated into the secondary education curriculum. Also, individuals should take part in aerobic dance 4 to 5 days a week in order to enhance the potency and effectiveness of the aerobic dancing programme in eliminating cardiovascular risk factors.*

KEYWORDS: Aerobic Dancing, Physiological Components, RHR, RSBP, RDBP.

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INTRODUCTION/LITERATURE REVIEW

The prominent rationale behind the establishment of educational institutions was to develop individuals cognitively, psychologically, sociologically, and scientifically to contribute to the development of self and society. However, the process of implementing these values in learners requires a functional and healthy body that can appropriately withstand the strenuous procedures involved in learning in Nigerian schools. Fundamentally, in today's complex world, healthy living and wellness are among the prime concerns of every individual, group, and organisation. The health of an individual is usually of concern to both the person and other associates. The health quotient of a person also determines his efficiency in working in an increasingly complex environment, but unfortunately, health is being challenged by ever-increasing diseases and social complexities of life. Among the most prevalent diseases in society are diabetes, arthritis, hypertension, and heart diseases, which, if unchecked, may have a deteriorating effect on an individual (World Health Organisation, 2021), especially affecting an individual's body composition and metabolic rate.

The course of maintaining an active human body requires various measures: diet, pharmacological and non-pharmacological (Effiong, 2019). Among these measures, a non-pharmacological approach could be considered as the pivotal fulcrum that sustains the load and effort of dietic and pharmacological approaches without unrelated side effects. In other words, a non-pharmacological approach assists in regulating the negative effect of the immensity of dietary and pharmacological approaches. Herguedas (2021) maintained that a pharmacological approach to health is a valid option if indicated as a preventive or curative measure because side effects of medications are avoided, health costs are brought down, and there is no significant environmental impact to this measure. One such measure is physical exercise.

Physical exercise has made a considerable investment in the wellbeing and protection of the physical fitness of the human body. This promoter of physical fitness is a prominent cost-free engagement that maximally enhances a man's health efficiency. It enhances physical exertion that stimulates the immune system to fight infection, clear arteries of fibrins, reduce mental pressure, and socially connect individuals with peers. Aerobic and anaerobic exercise may benefit on reducing anxiety and depression (Ghanbarzadeh & Mohamadi, 2012). Sports involvement provides individuals with good opportunities to learn particular social skills, such as tolerance and respect for others, and it can contribute to enhancing the social inclusion of students and decreasing their sense of hopelessness (Cashin, Potter, and Butler, 2008). Diverse physical exercise programmes have been promoted as having a relative impact on the management of the physiological components of the human body. One such physical exercise likely to have a remarkable impact on health is aerobic dancing programme.

Aerobic dancing programme as a physical exercise programme started in the United States of America through the invention of Sorensen in 1969 (Black, 2020). Sorensen was inspired by Kenneth Cooper's experiment on the functions of aerobic exercises as captured in the Book titled "Aerobic" in 1979. It is known to be established through the combination of dance step patterns and other bodily movements, including walking, jogging, hopping, skipping, jumping, and kicking accompanied by the rhythmic beat of music (Awopetu, 2017). Put differently, Otinwa and Akinyemi (2021) considered it as a physical exercise programme that produces changes in the respiratory and circulatory systems using large muscle groups with the fun of dancing. The author classified aerobic dancing programmes into high-impact exercise and low-impact exercise. These programmes are argued to produce immense benefits in meeting a

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modest increase in oxygen intake; improves cardiovascular health by decreasing blood pressure, improving blood sugar level, help in weight management, muscle strength, coordination, flexibility and balance (The American College of Sports Medicine, 2015); as well as serving as preventive medicine.

Unfortunately, in spite the acclaimed importance of physical activities/exercise which aerobic dancing programme is among, statistics have shown that greater percentage of Nigerians still live sedentary lifestyle (Guthold, Stevens, Riley and Bull, 2020; Odunaiya, Ayodele, and Oguntibeju, 2010; Odunaiya, Grimmer, and Louw, 2015; Adeniyi, Okafor and Adeniyi, 2011). Otinwa (2010) upheld that among the group of physically inactive Nigerians, females assume a greater percentage than males. This becomes more worrisome as the population of females is already being exposed to various reproductive, hormonal, and psychosocial vulnerabilities. The relativity of these health challenges among females may be evidenced in the high rate of mortality recorded among them in Nigeria (National Bureau of Statistics, 2021). Unfortunately, record has it that female mortality pattern of cardiovascular diseases is greater than that of males (Ogunmola & Akintomide, 2013). Thus, without exaggeration, this heightened mortality rate may not be unconnected with their mismanagement of physiological health conditions.

The human physiological component is an aspect of human health that is vital for effective human survival. These ranges from resting heart rate (RHR), diastolic blood pressure, to systolic blood pressure. The balancing of this physiological characteristic of students not only stabilises their concentration level but could have a ripple effect on their potency to withstand stress associated with workload, provide formidable bedrock for relaxed interest, and enhance relative capacity. Where these variables are inappropriately managed, the tendency is high that the students may experience excessive exhaustion, general weakness, and apathy to studies.

Elevated resting heart rate, for instance, has been considered an independent cardiovascular risk factor that is positively associated with arterial stiffness (Palatini et al., 2006), with a resultant effect on students' learning effectiveness and efficiency. The World Health Organisation (2020) maintained that RHR averages 60 to 80 beats/min. When the RHR exceeds this limit, it results in arterial stiffness, which could independently predict future cardiovascular events and all-cause mortality (Vlachopoulas, Aznaouridis, and Stefanadis, 2010). However, it is argued that involvement in routine exercise could drastically normalise human resting heart rate, and in turn, prevents the development of many chronic related diseases (Blavo, Ayoade and Oreleye, 2016), as well as aerobic dancing improving women’s cardiovascular health by decreasing blood pressure, improving blood sugar level, help in weight management, muscle strength, coordination, flexibility and balance (World Health Organisation, 2019, Ademola and Awopetu, 2021). Whether this is applicable to the aerobic dancing programme is a source of contemplation in this study.

The prevalence of high blood pressure is another sad end to the health and wellbeing of Nigerians, especially the students. According to the World Health Report (2019), high blood pressure contributes to a high avoidable death rate. Thus, this constitutes one of the prominent factors in students’ dropout rate, repetition rate, and decreasing progressive rate in schools (World Health Organisation, 2021). This is based on the fact that the affected students, instead of concentrating on their learning process, are left in the medical facilities for hypertension-related disease management. The high prevalence of high blood pressure could be a result of inadequate blood pressure control resulting from noninvolvement of students in physical activity such as aerobic dancing programmes. Nevertheless, Paffenbarger, Hyde, Wing, Lee,

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Jung, and Kampert (2019), in a 6-10 years follow-up of 15.000 individuals graduated in Harvard, verified that those who practiced physical exercises regularly presented risk 35% lower of developing arterial hypertension when compared with inactive individuals. According to the authors, when those who started sportive activity moderately intense (corresponding to an intensity of 4.5 or more metabolic equivalents) were compared with those who did not participated in this type of training, they observed a reduction of 23% in the death risk (confidence interval of 95%, 4% for 42%; p = 0.015). The Paffenberger etal's findings were similar to the Durrani and Fatima (2014) study on the relationship between physical activity and blood pressure in 701 school children aged 12–16 years (girls = 338, boys = 363) which revealed that the range of systolic blood pressure and diastolic pressure were found to be high in low risk blood pressure (LBP) group than in elevated blood pressure (EBP) group showing direct association of activity level and systolic/diastolic blood pressure. Physical activity score was found to be higher in the LBP group than in the EBP group. The results support the hypothesis that RSBP and RDBP are independently related to the level of habitual physical activity in children. Whether this is applicable to the aerobic dancing programme is a source of contemplation in this study. Thus, it becomes critically important to assess the effect of the aerobic dancing program on female students in the Uyo local government area arising from the prevalence of cardiovascular challenges in recent times.

Purpose of the Study

The purpose of this study was to determine the effect of aerobics dancing programme on physiological components of female undergraduate students in University of Calabar. Specifically, the study determined the effect of aerobic dancing programmes on the resting heart rate, resting systolic blood pressure, and resting diastolic blood pressure of female undergraduate students at the University of Calabar.

Research Question

To what extent does the aerobic dancing program affect the resting heart rate, resting systolic blood pressure, and resting diastolic blood pressure of female undergraduate students at the University of Calabar?

Statement of Hypothesis

Aerobic dancing programmes do not significantly influence the resting heart rate, resting systolic blood pressure, and resting diastolic blood pressure of female undergraduate students at the University of Calabar.

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METHODOLOGY

The study adopted pretest and posttest quasi-experimental research design. The population was made up of 1226 year one female undergraduate students in the 11 Faculties of the University of Calabar from which a sample of 60 female students were selected using a multistage sampling technique combining clustering and simple random sampling techniques. The instrument for data collection was the OMRON digital sphygmomanometer by OMRON Healthcare Co. Ltd. CE 0197, made in Vietnam. The digital sphygmomanometer was used to determine the resting heart rate and resting systolic and diastolic blood pressures. Each participant was made to sit comfortably on a chair with elbow slightly flexed, the cuff firmly wrapped around the upper arm at levels of the heart aligned the arrow on the cuff with the brachial artery, the systolic and diastolic blood pressures on the monitor were noted and recorded.

The Exercise Programme: The experimental model was a disco model of aerobic training to music, which was created with the aim of affecting the body composition of the subjects in the experimental group. A total of six training sessions took place over a period of two weeks, and each training session lasted for thirty to forty minutes. The aerobic dance was led by an experienced aerobics dance teacher. All of the parts of the training session were accompanied by music of a high tempo of 132-140 bpm metronome beat. The music tempo for the warm-up exercise was of moderate tempo of 86-97bpm metronome beat to prepare the joints and muscle groups for the aerobic dance.

Treatment Description

Warm up for 5 minutes

i. Hands up, down, across chest, swing side to side

ii. Forward bend (x10)

iii. Arm across chest (x10 per side)

iv. Forward lunge (x10 per side)

v. Squat, stand (x10)

vi. Stretches (to the front, back, and sideways)

vii. 3 deep breaths

Routine

Dance aerobics

i. March in place with elbows swinging back and forth (20 reps)

ii. March in place with hands up and down (20 reps)

iii. March in place with stretched side to side (20 reps)

iv. Step touch (20 reps, 2 sets)

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v. Knee lifts (10 reps per side, 2 sets)

vi. Tap up, tap down (like shooting in basketball) (10 reps per side, 2 sets)

vii. Waist curls (20 reps, 2 sets)

viii. Kick side to side (20 reps, 2 sets)

ix. Punches (20 reps, 2 sets)

x. Step bend (hands on shoulder) 20 reps, 2 sets

xi. Jumping jacks (20 reps, 2 sets)

Cool down (5 minutes)

i. Hands up, down, swing side to side

ii. Forward bend (x10)

iii. Stretches (forward, backward, and sideways)

iv. Arm acrosschest (x10)

v. Shoulder shrug (x10)

vi. Neck rotation (x10 per side)

vii. 3 deep breaths

All analysis was performed using mean scores, and significant differences between groups were determined using the Normalised gain analysis. This analysis took into consideration the pattern of the research hypothesis that was formulated, which tested the level of significance of the aerobic dancing programme without emphasis on the comparison between the experimental group and the control group. In this study, students were first tested without the aerobic dancing programme. Their physiological characteristics indicators (resting heart rate (RHR), resting systolic blood pressure (RSBP), and resting diastolic blood pressure (RDBP) were measured and recorded. After that, some students were exposed to aerobic dancing programmes that lasted for weeks as a measure for the management (reduction) of their cardiovascular-related characteristics. The programme was used to obtain the post-test values. The research design is shown in Figure 1 as follows.

O_1	X	O_2
Pretest	Treatment	Posttest

Figure 1. One Group Pretest-Posttest Design.

The data obtained in this study is quantitative data of pre-test and post-test results through measurement of students' physiological characteristics. The data processing in this research began by obtaining the measurement of pre-test and post-test values of students' physiological characteristics. Subsequently, the effect of aerobic dancing on the physiological characteristics of female students was determined by using normalised gain analysis. The development before

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and after the aerobic dancing programme was calculated by computing the normalised gain equation <g> as follows.

$$\langle g \rangle = \frac{\text{Score of posttest} - \text{score of pretest}}{\text{Maximum score} - \text{score of pretest}}$$

Table 1. Normalised gain criteria

<g>	Criteria
(<g>)≥ 0.7	High
0.3< (<g>)<0.7	Moderate
(<g>) < 0.3	Low

RESULTS

Research Questions 1a: How does the aerobic dancing programme affect the resting heart rate of female students at the University of Calabar?

Table 2: Mean and standard deviation of the resting heart rate of female students in Uyo in Experimental and Control Groups

Groups	Mean Test		Standard Deviation		N
	Pretest	Posttest	Pretest	Posttest	
Expt	79.50	74.10	8.482	7.885	40
Control	78.95	82.55	6.117	6.992	20

Table 2 indicates post-test mean scores of 74.10bpm and 82.55bpm for experimental and control groups, respectively. This reduction in the mean of posttest assessment in the experimental group as compared to that of the control group implies a significant positive effect of aerobic dancing programme in the management of students' resting heart rate.

Research Hypothesis 1a: Aerobic dancing programmes do not significantly affect the resting heart rate of female students at the University of Calabar.

Table 3: Normalised Gain (N-gain (g)): Mean and Standard Deviation of the effect of the aerobic dancing programme on resting heart rate of female students in Uyo (N=40)

Test	Mean	Stand.Dev	N-gain (g)	Criteria
Pretest	79.5	8.482	0.14	Low
Posttest	74.1	7.885		

Table 3 indicates the N-gain (g) level of effect of the aerobic dancing programme as 0.14. This indicates that the normalised gain resulting from aerobic dancing on resting heart rate of students was significant, though to a low level.

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Research Questions 1b: How does aerobic dancing programme affect resting systolic blood pressure of female students in University of Calabar?

Table 4: Mean and standard deviation of the resting systolic blood pressure of female students in the University of Calabar in Experimental and Control Groups

Groups	Mean Test		Standard Deviation		N
	Pretest	Posttest	Pretest	Posttest	
Expt	121.7	114.8	8.370	8.134	40
Control	118.45	124.0	8.312	8.398	20

Table 4 indicates posttest mean scores of 114.8mmHg and 124.0mmHg for experimental and control groups, respectively. This reduction in the mean of posttest assessment in the experimental group as compared to that of the control group implies a significant positive effect of aerobic dancing programme in maintaining the resting systolic blood pressure in students.

Research Hypothesis 1b: Aerobic dancing programmes do not significantly affect the resting systolic blood pressure of female students at the University of Calabar.

Table 5: Normalised Gain (N-gain (g)): Mean and Standard Deviation of the effect of the aerobic dancing programme on resting systolic blood pressure of female students. (N=40)

Test	Mean	Stand.Dev	N-gain (g)	Criteria
Pretest	121.7	8.370	0.08	Low
Posttest	114.8	8.134		

Table 5 indicates the N-gain (g) level of effect of the aerobic dancing programme as 0.08. This indicates that the normalised gain resulting from the effect of aerobic dancing programme on resting systolic blood pressure was significant though to a low level.

Research Questions 1c: How does aerobic dancing programme affect the resting diastolic blood pressure of female students at the University of Calabar?

Table 6: Mean and standard deviation of the resting diastolic blood pressure of female students in the University of Calabar in the Experimental and Control Groups

Groups	Mean Test		Standard Deviation		N
	Pretest	Posttest	Pretest	Posttest	
Expt	67.32	64.05	7.065	6.368	40
Control	66.10	69.00	4.178	3.178	20

Table 6 indicates post-test mean scores of 64.05mmHg and 69.00mmHg for experimental and control groups, respectively. The reduction in the mean of posttest assessment in the experimental group as compared to that of the control group implies a significant positive effect of aerobic dancing programme in the management of students' resting diastolic blood pressure.

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Research Hypothesis 1c: Aerobic dancing programmes do not significantly affect the resting diastolic blood pressure of female students at the University of Calabar.

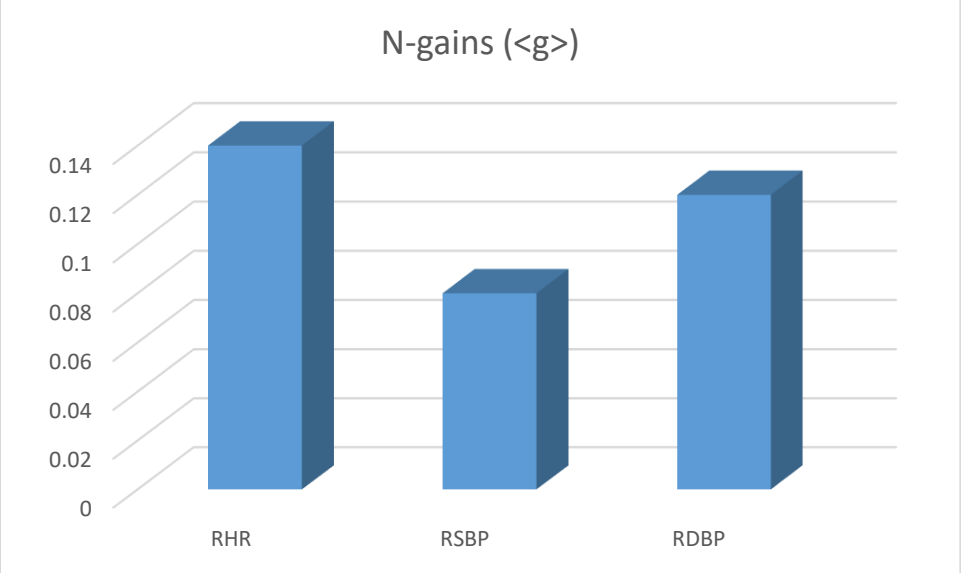
Table 7: Normalised Gain (N-gain (g)): Mean and Standard Deviation of the effect of the aerobic dancing programme on resting diastolic blood pressure of female students. (N=40)

Test	Mean	Stand.Dev	N-gain (g)	Criteria
Pretest	67.32	7.065	0.12	Low
Posttest	64.05	6.368		

Table 7 indicates the N-gain (g) level of effect of the aerobic dancing programme as 0.12. This indicates that the normalised gain resulting from the effect of the aerobic dancing programme on resting diastolic blood pressure was significant, though to a low level.

Table 8: Summary of N-gain Test

Physical/Physiological Indicators	Average scores		<g>	Criteria
	Pretest	Posttest		
RHR	79.5	74.1	0.14	Low
RSBP	121.7	114.8	0.08	Low
RDBP	67.32	64.05	0.12	low



Description:

RHR: Resting Heart Rate
RSBP: Resting Systolic Blood Pressure
RDBP: Resting Diastolic Blood Pressure

Figure 2: Summary of N-gain Analysis Chart

Table 8 and Figure 2 indicate that RHR scored the most significant rise with N-gain (<g>) score at 0.14. On the other hand, the lowest increase occurred in resting systolic blood pressure (RSBP).

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DISCUSSION OF RESEARCH FINDINGS

The results in Tables 2, 4, and 6 indicate that there is a significant effect of aerobic dancing programme on resting heart rate, resting systolic blood pressure, and systolic blood pressure of female undergraduates in the University of Calabar. Arising from the research question answered, it is revealed that the posttest mean score assessment of participants in the experimental group was more reduced compared to that of the control that lived a sedentary lifestyle. The results aligned with the conclusion drawn by World Health Organisation (2019), Ademola and Awopetu (2021), Paffenbarger, etal., (2019), and Durrani etal., (2014) that aerobic exercise can improve women's cardiovascular health by reducing activation of the sympathetic nervous system, as well as increasing the activity of the parasympathetic nervous system resulting in reduced RHR, systolic and diastolic blood pressure.

CONCLUSION

Based on the findings of the study, it is concluded that aerobic dance performed 30–45 min, 3 days · week $^{-1}$ for 2 weeks with a music of high tempo of 132-140bpm metronome beat significantly reduce/improves physiological functions, although to a low normalised again. This low level gain may be due to the inconsistency in sustaining the regularity of the programme. Nevertheless, it has a vital positive impact on the improvement of students' resting heart rate, normalising resting systolic and diastolic blood pressure when sustained. In other words, aerobic dancing programs are better than a sedentary lifestyle in the normalisation of resting heart rate, as well as normalising resting systolic and diastolic blood pressure. Hence, it is a vital physical activity that reduces excessive buildup in resting heart rate in the human body as well as the rising systolic and diastolic blood pressure.

RECOMMENDATIONS

Based on the conclusion drawn from the findings of the study, the study recommends the following since aerobic dancing programme is capable of lessening excessive resting heart rate, resting systolic and diastolic blood pressure:

i. It should be incorporated into the educational institutions' curriculum. This would enhance the quality and wellbeing of the students and, in turn, contribute to the stimulation of their cognitive efficiency.

ii. Individuals should take part in aerobic dance 4 to 5 days a week in order to enhance potency and effectiveness of the aerobic dancing programme in eliminating cardiovascular risk factors.

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