# Effect of Dance-exercise and Brisk-walking on Cardio-respiratory Indices of obese Undergraduates in Lead City University, Ibadan

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## Abstract
The aim of this study was to investigate the effectiveness of dance-exercise and brisk-walking on cardiorespiratory indices of obese undergraduates in Lead City University, Ibadan, Nigeria. Sixty (60) obese students were purposively sampled and randomized experimental Pretest-posttest control group design was used for the study. The participants were required to Dance-exercise and Brisk-walk 3 times a week, 50 minutes per session at 100-120bpm for 8 weeks. Analysis of Co-variance (ANCOVA) and T-test were used to test the hypotheses formulated at 0.05 significance level. Result revealed that there was a significant main effect of treatments ($F_{(2, 36)} = 3.442$, $p<0.05$, $\eta^2=0.043$) on the cardiorespiratory indices of obese undergraduates. Alsothere was no significant main effect of sex on the cardiorespiratory ($F_{(1, 37)} = 0.598$, $p>0.05$, $\eta^2=0.016$ indices of obese undergraduates. Furthermore, there was no significant interaction effect of treatments and sex on the cardiorespiratory ($F_{(2, 33)} = 0.063$, $p>0.05$, $\eta^2=0.004$) indices of obese undergraduates.The study concluded that Dance-exercise and Brisk-walkingare exercise modes that can bring positive changes in the cardiorespiratory indices of obese individuals. Additionally, sex was not a determinant of the outcome of Dance-exercise and Brisk-walking exercise modes on cardiorespiratory indices of obese undergraduate in this study. The study recommends that the school authority should organize periodic sensitization programme on different exercises including Dance-exercise and Brisk-walking as means of improving cardiorespiratory fitness of individuals. Dance-exercise and Brisk-walkingare not cost intense and can be incorporated in fitness programmes as they affect cardiorespiratory indices especially of obese individuals.

**Keywords:** Dance-exercise, Brisk-walking, Cardiorespiratory, Obese.

**Word Count:** 249 words

## Introduction

Obesity is a multifaceted illness, which affects people at all ages, but it is most common in infants, teenagers, and the elderly. Global health issues are now being created by the frightening rise in obesity. According to (Brosse, Sheets, &Lett (2022) Nigeria is not exempt from the problem, which is currently spreading quickly throughout several middle- and low-income nations. Weight gain that is abnormal or excessive and poses a risk to health is what is meant by the terms "overweight" and "obesity." Overweight is defined as a body mass index (BMI) of 25, and obesity as a BMI of greater than 30,according to (WHO 2022).

The majority of bodily systems are affected by obesity which have an impact on the reproductive system, joints, liver, kidneys, and heart. Numerous non-communicable diseases (NCDs), including type 2 diabetes, cardiovascular disease, hypertension, stroke, several types

of cancer, and mental health problems are caused by it (World Health Organisation WHO, 2022). Furthermore, (WHO. 2022) attested that, hospitalization for COVID-19 is three times more common in obese individuals. Over 1 billion individual's, including 650 million adults, 340 million teenagers, and 39 million children, are obese globally. This figure is still rising. 167 million adults and children will have worse health by 2025 as a result of being overweight or obese.

The combination of physical activity and diets is intended to promote improved physical fitness, mental wellness, and overall health. Dieting is a mix of physical activity and consuming a range of meals to provide one with the nutrients required for energy and good health. Dieting is frequently used in conjunction with physical activity to help people lose weight, particularly those who are overweight or obese. Eating a range of meals that provide one with the nutrients needed to be healthy, feel well, and have energy is what healthy eating entails. Protein, carbs, fat, water, vitamins, and minerals are among the nutrients (Indiantimes.com, 2018).

According to (Anne Med, 2021, pg. 495–507), exercise has been linked to improved endurance and health-related quality of life. Breathing exercise was found to be an effective approach to prevent post-operative lung cancer problems, resulting in a higher quality of life for patients in a study on lung cancer. Furthermore, Regular exercise can also help to avoid cardiovascular disease (CVD)(WHO, Sustainable Development Goal, 2019). As opined by (Colin, 2020, pg. 78:77), physical exercise is inversely associated to the risk of cardiovascular disease, according to another study. Exercise lowers the risk of cardiovascular events such as myocardial infarction (heart attack) and stroke by about 30%. As a result, exercise can help individual's feel better and live longer (Dhana, Koolhaasm., Rossum., Ikram, Hofman &Kavousi, (2016).

Dance also necessitates the adoption of various postures such as sitting, bending, standing, and knee bending. It has been reported to be effective in establishing a desirable body composition, improving motor ability, and improving pulmonary function status (Mikela & Nylander-French, (2018). In terms of metabolism, this means that dancers attain high peaks of exercise intensity that alternate with active or passive recovery periods, not allowing for oxygen consumption (VO2) or heart rate (HR) stabilization over the course of the exercise.

Dancing is not only enjoyable, but it also provides a beneficial workout for weight loss. Every day, a 30-minute workout is required to maintain good health (Metteo Giuriato, Valentina Binno, & Marianna Bellafiore, 2021). However, in order to lose weight, one must raise the intensity or duration of their workout. It goes without saying that one's diet is extremely important. To lose weight, one must decrease the calorie intake to generate a calorie deficit, which is the first stage. Some elements that influence calorie burn are beyond one's control. Two such influences are age and body composition.

The faster the dance, the more calories burnt. Various styles of dance aid in the burning of a variety of calories in the same period of time. One can burn twice as many calories in a ballet dance class has been done in a modern dance lesson. A person can burn 400 calories in one hour of dancing if they use the correct intensity, music, moves, and eat a well-balanced diet. People with a higher BMI can lose up to two to three pounds every week (Metteo Giuriato, Valentina Binno, & Marianna Bellafiore, (2021).

Walking is an excellent gentle start for the sedentary, particularly the elderly who are inactive and immobile, and it provides an added benefit of freedom and social well-being. On most days, a steady transition from slow to regular to 30 minutes or more of brisk (6.4 km/h)

walking is recommended. These levels should provide significant increases in exercise and health-related fitness while causing no negative consequences. Personal motivation, therapeutic practice, and public health might all benefit from such goals. On a treadmill, Brisk-walking at 100 steps per minute or 3.5 miles per hour can improve physical, mental, and emotional wellness, which is faster than a stroll (All Health Matter Ltd, 2022).

Walking has mental and emotional benefits in addition to physical ones. In a study of healthy older persons, the effects of exercise such as Brisk-walking were examined. Adults who took regular brisk walks fared better on cognitive tasks than adults who did not (J.I. Zhiguang, , Tian Feng,LIU. Xiaolei ,ONE. Yihong, FanyingMeng,Ruoqing Wang, Jialing Lu, &Chunhua Zhang, 2017)

According to (Jordan King &David Lowery, 2022) Due to an increase in both heart rate and stroke volume, cardiac output rises during physical exercise. The cardiovascular adaptations to exercise are quick at first: "Within a second following muscle contraction, vagal outflow to the heart is withdrawn, followed by an increase in sympathetic stimulation of the heart. "This causes an increase in cardiac output, which ensures that blood supply to the muscle matches metabolic demands".The ability of the circulatory and respiratory systems to give oxygen to skeletal muscles during persistent physical activity is referred to as cardiorespiratory fitness (CRF).Cardiorespiratory fitness (CRF) is another dimension of physical health that relatively linked to beneficial health outcomes to individual's. CRF is a trait and is defined as the ability of the circulatory, respiratory, and muscular systems to supply oxygen during prolonged moderate-to-vigorous dynamic exercise (Geetha Raghuveer, et.al, (2020). Therefore, physical activity and cardiovascular fitness are related, but not identical. CRF is usually measured using treadmill or ergometer exercise tests and is often expressed as maximal oxygen consumption (VO2max), whereas PA is often assessed through self-report (Johannes Zeiher,et.al, (2019).

Non-communicable diseases (NCDs) eradicate 41 million people each year, equivalent to 71% of all deaths globally(WHO, NCD, 2021). Over 23.3 million people would die each year from cardiovascular disease by 2030, according to(Maedeh Amini, Farid Zayeri&Masoud Salehi,(2021), it was estimated that the majority of these deaths will occur in low- and middle-income countries, which are undergoing fast dietary and socio-economic changes. As a result of these changes, (wikipedia.org/wiki/Anthropometry,(2021) opined that there has been a significant shift in behavior and lifestyle, with a high prevalence of sedentary lifestyles causing energy imbalances, leading to overweight and obesity, which are well-established risk factors for various chronic metabolic diseases, including cardiovascular diseases, independently regarded as the world's fifth leading cause of death(Baten, Joerg & Komlos, John,2004, pg. 191–210).

Central obesity presents a much higher risk for CVD than general obesity or body fat accumulation in the body. The effectiveness of lifestyle change with an emphasis on regular physical exercise has been demonstrated in intervention and preventative techniques. Interventions to counter the rising prevalence of obesity in less developed developing and developed countries should be culturally suitable, cost efficient, convenient, fun, and easy to maintain over time.

There is no denying that technological advancements are dramatically transforming people's daily lives and how they function. The increase in the prevalence of obesity worldwide has

prompted most countries to focus on its prevention and treatment to improve public health. Exercises such as dance and Brisk-walking are parameters to gain fitness, lose weight, become healthy and particularly have all-round development in the body. However, it was observed that undergraduates of tertiary institutions dedicate little time to well-planned exercises and fitness programmes.

**Statement of the Problem**

It was also observed that undergraduates engage in sedentary life styles such as internet surfing, studying and hanging out with friends, such undergraduates equally involve in consumption of junks such as carbonated substances and snacks, which in the long can lead to development of obesity, which could cause somehealth related diseases (High blood pressure and heart attack). Undergraduates who are obese are likely to remain so into adulthood as this is also a high risk period for weight gainIn spite of the of undergraduates' involvement in sedentary life styles and consumption of unhealthy foods (junks); previous studies focused more on impact of step-aerobic dancing training programme on body composition markers in middle-aged inactive obese women and effect of brisk-walking on anthropometric indices and physiological characteristics of obese adults(Ismail-Orire, Halimatl'ya, 2021).

On the other hand, previous studies paid little concentration on the effect of Dance-exercise on cardiorespiratory indices of obese undergraduates particularly in Lead City University. This study therefore, investigated the extent to which each treatment (training) will have effect on the cardiorespiratory indices of the obese undergraduates, and which of the treatments will be more effective on cardiorespiratory indices of the obese undergraduates.

**Hypotheses**

The following hypotheses were tested.

**$H_O$1.** There will be no significant main effect of treatments (Dance-exercise and Brisk-walking)
on the cardiorespiratory indices (heart rate and blood pressure) of obese undergraduates in Lead City University, Ibadan, Nigeria.

**$H_O$2.**There will be no significant effect of sex on the cardiorespiratory indices of obese Undergraduates in Lead City University, Ibadan, Nigeria.

**$H_O$3.**There will be no significant interaction effect of treatments (Dance-exercise and Brisk-Walking) and sex on cardio respiratory indices (heart rate and blood pressure) of obese Undergraduates in Lead City University, Ibadan, Nigeria.

**Methodology**

Ethical approval was obtained by the researcher from Lead City University Health Research Ethics Committee (LCU- HREC). After approval, the undergraduates of Lead City University categorized as obese were approached as a group by the researcher in order to inform them about the aim and benefits amass to them on the research and make them see reasons to participate in it. Participation was however made voluntary as no participants was forced to participate against their personal wish. The population for this study consisted of all male and female undergraduates of Lead City University, Ibadan, Nigeria categorized as obese. The sample size for this study was sixty students who were categorized as obese after screening utilizing body mass index and waist-hip-ration categorization by World Health Organisation

(WHO). The participants were chosen using a multistage sampling technique. The following are the phases involved in the procedure:

**Stage 1:** Purposive sampling technique was used to select sixty undergraduates categorized as obese in Lead City University.

**Stage 2:** Simple random sampling technique was used to randomly assign participants to the three groups of two experimental and a control. This was accomplished through the use of the ballot system. The treatment and control groups were assigned through balloting, with the researcher labeling the intervention and control programmes.

In order to investigate the effect of dance-exercise and brisk-walking on the cardiorespiratory indices of obese undergraduates in Lead City University, Ibadan, Nigeria, standardized instruments were used. These are explained as follows:

The training programme was continuous low-moderate impact dance-exercise and brisk-walking performed by experimental group 1 and 2 respectively, while the control group was placed on placebo (Health talk – Nutrition Education) for 8 week.

**Cardiorespiratory Indices**

In determining cardiorespiratory indices, heart rate as an indices and was calculated as follows:

i. At the wrist, lightly press the index and middle fingers of my hand just below the base of the thumb.At the neck, lightly press the side of the neck, just below the jawbone.
ii. Then Count the number of beats in 15 seconds, and multiply by four. That's the heart rate.

A normal resting heart rate for adults ranges from 60 to 100 beats per minute. Generally, a lower heart rate at rest implies more efficient heart function and better cardiovascular fitness. Sphygmomanometer was also be used to cross check the heart rate, so as to ensure accurate measure of the heart rate.

**Blood Pressure**: This was measured using Sphygmomanometer and Stethoscope, with the help of qualified medical personnel (Nurse), the blood pressure of the respondents was taken.

The training programme lasted for eight week, three sessions per week. Dance-exercise was carried out by playing afro music with the temp at 100BP – 120BPM using VLC on a sound system, Brisk-walking was carried out outdoor on the track using sound system to make the walking interesting at the same tempo with Dance-exercise to equate the intensity and frequency. The placement day was Tuesday, Thursdays and Saturdays for experimental group 1, Mondays, Wednesdays and Fridays for experimental group 2, while Mondays and Wednesdays was for control group. Each training session had segment of warm up, followed by main activity and ended with cool down exercises. The researcher with the help of five (5) research assistants undertook the administration, measurement and recording of data. Body Mass Index and Waist-to-Hip-Ratio measurement was taken.

**Treatment Group:** There was pretest measures taken of the selected dependent variables on the participants in the groups before they were made to go through an eight weeks Dance-exercise and Brisk-walking session using moderate intensity impact pace. After the intervention programme, the variables were tested again as the post-test measures.

**Control Group**: There was pretest of the selected dependent variables on the participants in the control group before they were placed on placebo (Health Talk on Nutrition Education) for eight weeks. The posttest measures took place after the 8 week of Nutrition Education.

The researcher, supervisor and research assistants in the field of exercise physiology endeavored to cross-check the workability of the instruments before use. Also, sygmomanometers was subjected to test-re-test to validate the instrument. Reliability of an instrument is the consistence of an instrument to measure what it is purported to measure. All the instruments that were used by the researcher for testing have been utilized by other researchers to test the various physical fitness components and have been found to be reliable.

Descriptive statistics of frequency and percentages were used to analyze the demographic data of the participants, mean and standard deviation were used to determine the anthropometric compositions of the participants, while Analysis of Co-variance (ANCOVA) and T-test were used to test the hypotheses formulated at 0.05 level of significance.

Results

This chapter presents results of the analyses and discussion of findings. The results and discussion of findings are organized to cover the following: demographic characteristics of the participants, research question and hypotheses testing and discussion of findings.

### 4.1 Demographic Data Analysis

The analysis of demographic characteristics of the participants is presented in table 4.1.

**Table 4.1.1: Distribution of the Participants by Sex**

| Sex | Frequency | Percent |
|---|---|---|
| Male | 25 | 62.5 |
| Female | 15 | 37.5 |
| Total | 40 | 100.0 |

**Source:** Field Survey, 2022

Table 4.1.1 reveals that 25 (62.5%) of the participants were males, while 15 (37.5%) were females. This means that, most of the participants were between males.

### 4.2 Presentation of data

**Ho1:** There will be no significant main effect of treatments (dance exercise and brisk walking) on the cardio-respiratory indices (heart rate and blood pressure) of obese undergraduates in Lead City University, Ibadan.

**Table 4.2.1 Summary of Analysis of Covariance of Main Effect of Treatments on Cardio-respiratory Indices**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| Corrected Model | 10989.041[a] | 3 | 3663.014 | 11.889 | .000 | .498 |
| Intercept | 9225.710 | 1 | 9225.710 | 29.945 | .000 | .454 |
| Pretest | 7989.756 | 1 | 7989.756 | 25.933 | .000 | .419 |
| Treatment | 2120.786 | 2 | 1060.393 | 3.442 | .043 | .161 |
| Error | 11091.334 | 36 | 308.093 | | | |
| Total | 3071881.000 | 40 | | | | |
| Corrected Total | 22080.375 | 39 | | | | |

Table 4.2.1 shows that that there was a significant main effect of treatments on the cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan ($F_{(2,36)}$=3.442, $p$<0.05, $\eta^2$=0.161. The null hypothesis was therefore rejected. This implied that the combined treatment (dance exercise and brisk walking) was effective on the cardio-respiratory indices of obese undergraduates in the study area. The eta square value of 0.161 shows the contributing effect size of 16.1%.

**Table 4.2.2: Estimated Marginal Means of Treatments on Cardio-respiratory Indices**

| **Treatment Groups** | **Mean ($\bar{x}$)** | **Std. Error** | **95% Confidence Interval** | |
|---|---|---|---|---|
| | | | **Lower Bound** | **Upper Bound** |
| Dance exercise (Experimental Group 1) | 286.946 | 5.610 | 275.568 | 298.324 |
| Brisk-walking (Experimental Group 2) | 277.463 | 4.995 | 267.333 | 287.593 |
| Control | 268.737 | 4.274 | 260.069 | 277.404 |

Table 4.2.2 shows the estimated marginal means of treatment on cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan. It was revealed that after controlling for the effect treatments on cardio-respiratory indices, the participants exposed to dance exercise had the highest mean score (mean=286.946), followed by those in the brisk-walking (mean=277.463), while the control group had a mean score of 268.737. This implies that dance exercise was more potent in relating to cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan.

**Ho2:** There will be no significant main effect of sex on the cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan.

**Table 4.2.3: ANCOVA Analysis of Main Effect of Sex on Cardio-respiratory Indices**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 9078.568[a] | 2 | 4539.284 | 12.918 | .000 | .411 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Intercept | 9235.813 | 1 | 9235.813 | 26.283 | .000 | .415 |
| Pretest | 9065.366 | 1 | 9065.366 | 25.798 | .000 | .411 |
| Sex | 210.312 | 1 | 210.312 | .598 | .444 | .016 |
| Error | 13001.807 | 37 | 351.400 | | | |
| Total | 3071881.000 | 40 | | | | |
| Corrected Total | 22080.375 | 39 | | | | |

Table 4.2.3 shows that that there was no significant main effect of sex on the cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan ($F_{(1,37)}$=0.598, $p$>0.05, $\eta^2$=0.016. The null hypothesis was therefore accepted. This implied that sex had no significant effective on the cardio-respiratory indices of obese undergraduates in the study area. The eta square value of 0.016 shows the contributing effect size of 1.6%.

**Table 4.2.4: Estimated Marginal Means of Sex on Cardio-respiratory Indices**

| | | | 95% Confidence Interval | |
|---|---|---|---|---|
| Sex | Mean | Std. Error | Lower Bound | Upper Bound |
| Male | 274.337 | 3.758 | 266.722 | 281.952 |
| Female | 279.105 | 4.860 | 269.257 | 288.952 |

Table 4.2.4 shows that female participants had a higher posttest mean score (279.105) than their male (274.337) counterparts. This implied that the sex had a better effect oncardio-respiratory indices of obese female undergraduates than their male counterparts.

**Ho3:** There will be no significant interaction effect of treatments (dance exercise and brisk walking) and sex on cardio-respiratory indices (heart rate and blood pressure) of obese undergraduates in Lead City University, Ibadan.

**Table 4.2.5: ANCOVA Analysis of Interaction Effect of Treatments and Sex on the Cardio-respiratory Indices**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 11067.948[a] | 6 | 1844.658 | 5.528 | .000 | .501 |
| Intercept | 9035.020 | 1 | 9035.020 | 27.074 | .000 | .451 |
| Pretest | 7627.311 | 1 | 7627.311 | 22.856 | .000 | .409 |
| Treatment | 1344.299 | 2 | 672.150 | 2.014 | .150 | .109 |
| Sex | 65.745 | 1 | 65.745 | .197 | .660 | .006 |
| Treatment*Sex | 42.370 | 2 | 21.185 | .063 | .939 | .004 |
| Error | 11012.427 | 33 | 333.710 | | | |
| Total | 3071881.000 | 40 | | | | |
| Corrected Total | 22080.375 | 39 | | | | |

Table 4.2.5 shows that that there was no significant interaction effect of treatments and sex on the cardio-respiratory indices of obese undergraduates in Lead City University, Ibadan ($F_{(2,33)}$=0.063, $p$>0.05, $\eta^2$=0.004. The null hypothesis was therefore accepted. This implied that treatment and sex had no significant interaction effective on the cardio-respiratory indices of

obese undergraduates in the study area. The eta square value of 0.004 shows the contributing effect size of 0.04%.

**Table 4.2.6: Estimated Marginal Means of Treatments and Sex on the Cardio-respiratory Indices**

| Treatment Groups | Sex | Mean ($\bar{x}$) | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| Dance exercise (Exp. Group 1) | Male | 287.172 | 8.172 | 270.545 | 303.799 |
| | Female | 286.804 | 8.307 | 269.903 | 303.705 |
| Brisk-walking (Exp. Group 2) | Male | 279.000 | 9.149 | 260.386 | 297.613 |
| | Female | 276.696 | 6.264 | 263.952 | 289.411 |
| Control | Male | 269.244 | 4.593 | 259.900 | 278.587 |
| | Female | 260.953 | 18.297 | 223.727 | 298.179 |

Table 4.2.6 shows that male participants in the treatment group 1 had a higher mean score (287.172) than their female (286.804) counterparts. This implied that the interaction of treatment and sex had a better effect on cardio-respiratory indices of obese male undergraduates who were exposed to dance exercise than their female counterparts. Table 4.10.2 further reveals that male participants in the treatment group 2 had a higher mean score (279.000) than their female (276.696) counterparts. This implied that the interaction of treatment and sex had a better effect on cardio-respiratory indices of obese male undergraduates who were exposed to brisk-walking than their female counterparts.

In the control group, the male participants had a higher mean score (269.244) than their female (260.953) counterparts. This implied that the interaction of treatment and sex had a better effect on cardio-respiratory indices of obese male undergraduates in the control group than their female counterparts. The overall comparison shows that male participants in treatment group 1 had the highest mean score, followed by male participants in treatment group 2, while the female participants in control group had the least mean score. It implied that the interaction of treatment and sex had a better effect on cardio-respiratory indices of obese male undergraduates who were exposed to dance exercise than their female counterparts in the same group and other participants in treatment group 2 and control group respectively.

**Discussion of Findings**

The result in this study revealed that there was a significant main effect of treatments on the cardiorespiratory indices of obese undergraduates in Lead City University, Ibadan, Nigeria. This is pertinent with objective number three of this study. This means that the combined treatment (Dance-exercise and Brisk-walking) was effective on the cardiorespiratory indices

ofobese undergraduates in this study. Decreased vascular resistance and organ adaptation to exercise could be the reason for the reduction of cardiorespiratory indices of obese undergraduates in the study. The findings of this study is in agreement with a previous study, which found significant training effect on physiological characteristics (systolic and diastolic blood pressure and heart rate) in obese adults (Ismail-Orire, Halimatl'ya,2021). Additionally, the findings of this study agreed with those of a prior study which showed that Brisk-walking and square dancing are effective in lowering blood pressure and heart rate(Liu, Hui, Kim, Jung&Kim, Ok-ja, pg. 76-87, 2021). In another study, on the effect of a twelve-week aerobic exercise Programme on health-related physical fitness components and blood lipids in obese females involving a total of 40 females with 20 in the exercise group and 20 in the control group, participants attended sessions that lasted 60 minutes each day, three days per week. Result showed there were significant differences in heart rate, and other parameters measured between pre and posttest scores in the exercise group. According to the findings, regular aerobic exercise may have a positive impact on health-related fitness components and blood lipids in females (Özcan Saygın& Mehmet Ali Öztürk, pg. 1441-1445, 2011 ).

The estimated marginal means of treatment on cardiorespiratory indices of obese undergraduates in Lead City University, Ibadan, Nigeria revealed that the control group had the highest mean score, followed by those in the brisk-walking, while dance-exercise group had a least mean score. This outcome corroborate the assertion that Dancing requires a lot of energy since it requires "movement in all directions," and that "there is a lot of accelerating and decelerating in dancing, which the body is less capable of doing in an energy effective way." If running is like driving on a highway, dancing is like driving through a city. Even if one is not traveling much territory, all of the starting, stopping, and changing directions consumes a lot of gasoline (Nick Smeeton, 2017).

In addition, it was found that there was no significant main effect of sex on the cardiorespiratory indices of obese undergraduates in this study. This implies that sex was not an important factor in the cardiorespiratory indices of obese undergraduates in this study. However, after controlling for initial difference, the main effect of treatment by sex on cardiorespiratory indices of obese undergraduates, female participants had a higher posttest mean score than their male counterpart. It can be inferred that the male participants had a better training effect in cardiorespiratory indices than their female counterpart. This validates a study conducted on Sex Differences in Cardiorespiratory Fitness and All-Cause Mortality: The Henry Ford Exercise Testing (FIT) Project (Mouaz H. et.al, pg. 755–762, 2017 ). This is one of the landmark long-term research on the relationship between fitness and mortality in men and women. It was discovered that men have higher cardiorespiratory fitness than women in this population of intermediate and high risk adults.

Finally, the study found that, there was no significant interaction effect of treatments and sex on the cardiorespiratory indices of the participants. Based on gender at the treatment level, it was found that male participants in the treatment group 1 had a higher mean score than their female counterparts. This implied that the interaction of treatment and sex had a better effect on cardiorespiratory indices of obese female undergraduates who were exposed to Dance-exercise than their male counterparts. Furthermore, male participants in the treatment group 2 had a higher mean score than their female counterparts. This implied that the

interaction of treatment and sex had a better effect on cardiorespiratory indices of obese female undergraduates who were exposed to brisk-walking than their male counterparts.

The overall comparison shows that female participants in treatment group 1 had the lowest mean score, followed by female participants in treatment group 2, while the male participants in control group had the highest mean score. It implied that the interaction of treatment and sex had a better effect on cardiorespiratory indices of obese female undergraduates who were exposed to Dance-exercise than their male counterparts in the same group and other participants in treatment group 2 and control group respectively.

**Conclusion**

Based on the findings of this study, it was concluded that Dance-exercise and Brisk-walking positively affectedthe cardiorespiratory indices of obese undergraduate and that sex was not a determinant of the outcome of Dance-exercise and Brisk-walking exercise modes on cardiorespiratory indices of obese undergraduate in this study.

**Recommendations**

i. The school authority should organize periodic sensitization programme on different exercises including Dance-exercise and Brisk-walking as means of improving fitness of obese students. This is important as Dance-exercise and Brisk-walking positively influence cardiorespiratory indices of obese individuals.
ii. Fitness trainers, coaches, sports agencies, should adopt Dance-exercise and Brisk-walking as an alternative types of exercises that can be utilized to meet the preferences of individuals averse to typical routine exercise in the quest for improving cardiorespiratory indices.
iii. Dance-exercise along with other forms of exercise can be incorporated in fitness programmes as they affect cardiorespiratory indices especially of obese individual's since Dance-exercise and Brisk-walking are not cost intensive and can be performed at any place and time.
iv. Relevant government, non-governmental organizations and agencies should adopt Dance and Brisk-walking exercise programmes for promotion of fitness and well-being of stakeholders.

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