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EFFECT OF A TWELVE-WEEK BRISK WALKING PROGRAM ON BODY MASS INDEX AND LEAN MUSCLE MASS OF OBESE FEMALE ADULTS IN KOGI STATE, NIGERIA

BY

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Abstract

This study assessed the effect of a twelve-week brisk walking program on BMI and lean muscle mass of obese female adults in Kogi State, Nigeria. Two objectives with their corresponding research questions were posed and two null hypotheses guided the study. Quasi-experimental design with Pretest-posttest experimental and control group guided the study. The population for the research was 456 obese female adults in Kogi State. Using purposive sampling method, 32 obese female adults with body mass index above 30.0kg/m2 and ages of 40 and 60 years who met the inclusion criteria were selected for this study. The following measuring instruments were used in this study: a recording sheet, stop watch, rigid bar, weighing scale, non-elastic tape and Omron body composition monitor. The subjects were divided into two groups, (experimental: 16 participants and control: 16 participants), the experimental group was subjected to a 12-week brisk walking. The twelve week brisk walking programme was conducted on 3 alternate days per week for 12 weeks. Body mass index and lean muscle mass were measured at base-line and at the end of 12th week of training period. The descriptive statistics of mean and standard deviation were used to answer the research questions while ANCOVA was used to test the hypotheses at 0.05 level of significance. The results of this study revealed that, the obese female adults in the experimental group had a reduction in body mass index (BMI) - 9.44, P = 0.03 < 0.05, those in the control group and significant increase in lean muscle mass 4.28, P = 0.00 < 0.05 due to the 12-week brisk walking and all effect size were small according to Cohen's guideline. It was concluded that brisk walking has significant effects on body composition of obese female adults in Kogi State, Nigeria. It was therefore, recommended that brisk walking should not only be prescribed for the modification of body composition, but be made a lifestyle practice for optimal weight management benefit. Brisk walking may also be used to assist individuals with obesity problem.

Keywords: Body mass index, Lean muscle mass, Obesity and Brisk walking

Introduction

The body composition of people all over the world is giving concern to experts and researchers in the field of exercise and health. A lot of people inaccurately assume that they are not in control of their body composition, that nature and heredity determine body composition which leads many to adopt unhealthy lifestyles that results to weight gain. However, there is a strong correlation between lifestyle practices and mortality globally. One of such lifestyle practices is physical inactivity or sedentary behavior, which has been highlighted as a significant cause of obesity, which may lead to metabolic and cardiovascular diseases and other related problems (Qiu, Wang & Liu, 2021). Body composition is one of the five components of health-related fitness. It is determined by comparing the body fat mass to its fat-free mass (bone, muscles and other tissues). Body composition is used to describe the percentages of fat, bone, water and muscle in the body. Obesity is generally accepted that anyone with a body mass index (BMI) equal to or greater than 30.0 kg/m² is classified as obese, (Ibrahim & Akram, 2021). This condition typically results from a chronic imbalance between energy intake and expenditure globally. People of almost any fitness level can find a comfortable walking pace to participate in this low-impact aerobic activity. Walking at a pace of 5.7km/h, Borg scale of perceived exertion 11 – 14 is considered brisk walking which is a popular and convenient form of exercise that plays an important role in weight management and it is often recommended for

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obese individual because it increases energy expenditure (Pino-Ortega, et al, 2021). Therefore, brisk walking as moderate aerobic exercise will be adopted for this study.

Given the alarming trends in body composition, it is essential to recognize that globally, obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults aged 18 years and older were overweight, with over 650 million classified as obese. At that time, 39% of adults aged 18 and over were overweight, while 13% were obese. Additionally, over 340 million children and adolescents aged 5-19 were reported as obese in 2016. Notably, most of the world's population resides in countries where obesity claims more lives than underweight (WHO, 2018). Currently, nearly 2 billion adults worldwide are classified as overweight, among whom over half a billion are obese. Over the last four decades, there has been a marked increase in obesity rates; the prevalence of obesity in men has risen from approximately 3% in 1975, while among females, it increased from just over 6% in the same year. (Qiu, Wang & Liu, 2021). During this period, the prevalence of being overweight has also grown, from 20% in males and just under 23% in females in many regions globally.

The prevalence of obesity was highest in the WHO regions of the Americas (62 per cent for overweight in both sexes, and 26 per cent for obesity) and lowest in the WHO region for South East Asia (14 per cent overweight in both sexes and 3per cent for obesity). In all WHO regions women were more likely to be obese than men. In the WHO regions for Africa, Eastern Mediterranean and South East Asia, women had roughly double the obesity prevalence of men (WHO, 2018). Worldwide, at least 2.8 million people die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3%) of global Daly's are caused by overweight or obesity. Overweight and obesity lead to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance (Qiu, Wang & Liu, 2021). The increment in obese individuals can be easily seen by comparing data of 2015 and 2016 when 38.7 per cent of adult females were obese worldwide which increased to 39.2per cent in 2016 and 38.0per cent of adult males were obese worldwide which increased to 38.5 per cent in 2016 (WHO, 2017).

In Nigeria, the prevalence of obesity was 11 per cent and 15 per cent among men and woman (WHO, 2018). A literature review and meta-analysis conducted in Nigeria indicated a rising trend of overweight 26.0 per cent and obesity 15.0 per cent over the years. The prevalence of obesity in the six geopolitical zones of Nigeria was south east 29.3 per cent southwest 13.9 per cent south-south 24.7 per cent, northwest 10.4 per cent, north-central 10.2 per cent, north-east 6.4 per cent (Chukwuonye & Ohagwu 2022). In Nigeria, nutritional and epidemiological transitions driven by demographic changes, rising income, urbanization, unhealthy lifestyles, and consumption of highly processed diets are among the leading contributors to overweight and obesity (WHO, 2018). In fact, the author asserted that, burden has extended to younger population age groups in the country with about 9per cent of children aged 5–9 years estimated to be obese or overweight. The prevalence of overweight and obesity in the 6 geopolitical zones of Nigeria was reported that in North-central overweight and obesity was 25.3per cent and 10.2per cent respectively, in which Kogi State was included. A study conducted by Zileli, (2016), also asserted that, lack of regular exercise has been identified as a major cause of obesity. Increasing use of motorized transport and sedentary types of occupation such as office work, accompanied by high risk dietary and lifestyle/behaviors were associated to the prevalence of obesity. Chukwuonye, (2022). Therefore, this study seeks to assess the effect of a twelve-week brisk walking on body composition of obese female adults in Kogi State, Nigeria

Body composition is a component of health - related fitness used to describe the percentage of fat, bone, water and muscle in the body expressed as percent body mass, visceral fat and lean muscle mass (Ibrahim & Akram, 2021). Body Composition is a physical measurement that provides more specific information about body make-up than body weight alone. Body composition is defined as the proportion of fat and fat free mass (FFM) in the body (Safaei, Sundararajan, Driss, Booulila & Shapi, 2021). Body composition is the component of human body in terms of its dimensions of bone, muscle and adipose (fat) tissue. The body composition encompasses a variety of human body measurements. Height, stature (standing height), recumbent length, skinfold thickness, circumference (head, waist, limb lengths, and breadths (shoulder, wrist and so on) are examples of body composition measures. Body composition connotes the percentage of fat, bone, water, and muscle in the body (Powell-Wiley, Poirier & Burke, 2021). Two types of same sex and body weight may look completely different from each other because they have a different body composition, (Powell-Wiley TM, et al., 2021). Percentage body fat (PBF) is total mass of fat divided by total body mass; and that includes essential body fat and storage body fat (Powell-Wiley *et al.* 2021).

ISSN 2736-0091
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Essential body fat is, necessary to maintain life and productive functions. The percentage of essential body fat for women is greater than that of men, due to the demands of childbearing and other hormonal functions (Devi, Nilupher, Gupta, Dhall & Kapoor, 2020). The percentage of essential fat is 3-5per cent in men (Shweta, 2019). Storage body fat consists of fat accumulation in adipose tissue, part of which protects internal organs in the chest and abdomen. A number of methods are available for determining body fat percentage, such as measurement with calipers or through the use of body fat hydration monitoring scale (Devi, Nilupher, Gupta, Dhall & Kapoor, 2020).

Body Mass Index (BMI) is a numerical value derived from an individual's weight and height, used to assess whether a person has a healthy body weight for their height. It is calculated using the formula BMI=weight in kilogram (height in meters) 2 or BMI= (height in meters) 2weight in kilograms (Vivek, Nagalaksmi & Basavaraju, 2021). BMI is categorized into different ranges to classify individuals: underweight (BMI less than 18.5), normal weight (BMI 18.5 to 24.9), overweight (BMI 25 to 29.9), and obesity (BMI 30 or greater). While BMI is a useful screening tool, it does not directly measure body fat and may not accurately reflect body composition in certain populations, such as athletes or those with high muscle mass (Kingsley, 2022). Despite its limitations, BMI is commonly used in clinical settings to identify potential health risks associated with being underweight, overweight, or obese, and it serves as a useful tool for researchers and public health officials to track trends in body weight across populations (Geeson-Brown *et al*, 2020).

Lean body mass is all of the bones, ligaments, tendons, internal organs and muscles. Lean mass contains only a small amount of necessary fat due to the fat that must be present in bone marrow and a number of internal organs. However, body composition analysis takes into account these minuscule amounts of necessary fat, giving individuals an accurate representation of their non-fat mass, (Piche, Tchernof & Despres, 2020). Having a significant amount of lean mass increases the metabolism, making it simpler to maintain a healthy weight. For instance, internal organs, such as the liver and heart, have a metabolic rate that is 50 to 100 times greater than their weight in fat. Muscle's metabolic rate is not as high as that of organs, but it is still significantly higher than that of fat tissue. Muscle mass cannot be lost without compromising physiological function by engaging in regular aerobic exercise, (Chooi, Ding & Magkose, 2019). However, this study seeks to assess the effect of a twelve-week brisk walking program on body composition BMI and lean muscle mass of obese female adults in Kogi State, Nigeria. Obesity is a condition in which person has an excessive amount of body fat, to the extent that it may negatively impact health. Obesity is typically defined by having a body mass index (BMI) of 30kg/m2 or higher, and is associated with a variety of health problems such as heart disease, type 2 diabetes, and certain types of cancer (Alissa, 2016).

Obesity also defined as excess of adipose tissue (Vivek, Nagalaksmi & Basavaraju & 2021). This extra fat is a repercussion of imbalance between total energy intake and total energy expenditure. When the energy intake exceeds energy expenditure for a prolonged period of time, overweight will occur and if this is not corrected, it will ultimately lead to obesity. (Ainala, 2015). WHO has declared it a global epidemic and a worldwide public health crisis that obesity has grown in numbers over the world in the past 30 years, In 2012, it was estimated that 35 per cent of all the adults over the age of 20 are overweight (BMI $\geq$ 25 kg/m2) and 11 per cent of them are obese (BMI $\geq$ 30 kg/m2) (WHO, 2018). This present study focused on obese female adults in Kogi State, Nigeria. An adult is generally defined as a person who is of legal age and is considered to be mature and responsible. In most countries, adulthood begins at 18 years old, although the exact age may vary depending on the culture or legal system. Adult is usually defined as the period of human development in which the physical development, cognitive development, and psychosocial development of women and men slow and reach their highest level (WHO, 2017). Data from NIHRDIMH (2018), in 2017–2018, the age adjusted prevalence of obesity in adults was 42.4%, and there were no significant differences between men and women among all adults or by age group. The age-adjusted prevalence of severe obesity in adults was 9.2% and was higher in women than in men. Among adults, the prevalence of both obesity and severe obesity was highest in non-Hispanic black adults compared with other race and Hispanic-origin groups (Alissa, 2016). The prevalence of severe obesity was highest among adults aged 40 and 59 compared with other age groups. From 1999–2000 through 2017–2018, the prevalence of both obesity and severe obesity increased among adults.

ISSN 2736-0091
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Brisk walking is a type of physical activity that involves walking at a pace that is slightly faster than normal, but not as fast as running (Borjesson, et al, 2016). It is an aerobic exercise that can improve cardiovascular health and fitness, as it gets the heart rate up and burns calories. Brisk walking is a low-impact exercise, meaning it doesn't put as much stress on the joints as running or high-impact exercises (Borjesson, et al, 2016). Brisk walking improves cardiovascular health: help lower blood pressure, improve heart health, and increases oxygen flow to the body. Brisk walking can be an effective way to manage weight and body composition. It helps to burn calories and improve muscle tone, improves mood and mental well-being, reduces stress, anxiety, and symptoms of depression, also help increase overall energy levels, as it improves circulation and the delivery of oxygen and nutrients to the body (Borjesson, et al., 2016).

In achieving the effect of brisk waking as an aerobic exercise, some exercise habit must be formed through application of theories. Many experts have propounded theories related to exercise behavior. This study anchored on these two theories and these theories include self-determination theory and achievement goal theory. Self-Determination Theory (SDT), (Deci and Ryan, 1991), stated that, when there is an intrinsic motivation, the individual will perform with high determination. It is one of the most widely used theory to study motivation in exercise, which is not surprising given that its major propositions and constructs are highly relevant to exercise. Achievement goal theory as propounded by Deci and Ryan, (1991), stated that, when there is an extrinsic motivation, the individual will participate with high determination to achieve a goal. It has been shown to be influential in exercise programme (Standage & Gillison, 2007). These theories were applied to assess the effect of a twelve-week brisk walking on body composition of obese female adults in Kogi State, Nigeria.

Statement of the Problem

There is an increasing trend of overweight and obesity among adults in developing countries of the world which makes it a major health problem. This is because obesity is one of the most pervasive and chronic disease that needs new strategies for medical treatment, management and prevention. In Nigeria, the prevalence of obesity was 11 per cent and 15 per cent among men and woman and the prevalence of obesity in the six geopolitical zones of Nigeria was, south east 29.3 per cent, southwest 13.9 per cent, south-south 24.7 per cent, northwest 10.4 per cent, north-central 10.2 per cent and north-east 6.4 per cent. Ideally, the BMI of individual should not be more than 24.5-29.9kg/m2, but the prevalence of obesity has risen steadily. The female adults in Kogi State are expected to have normal body weight of 24.5-29.9kg/m2 and not be obese and also free them from obesity and obesity related diseases, but preliminary survey of the researcher showed that, 456 female adults were obese in Kogi State, that is, having their body weight more than 30.0kg/m2. This prevalence of obesity has leads to related disease as a result of high BMI This prevalence trigger Chronic diseases such as hypertension, stroke, cancer, pulmonary diseases, cardiovascular diseases and coronary heart disease due to inadequate regular exercise, increasing use of motorized transport and sedentary types of occupation such as office work, accompanied by high-risk dietary and lifestyle/behaviors has been identified as a major cause of obesity in Kogi State.

There may be studies examine similar intervention in other location or with different participant demographics, there is a need for the researcher to directly address the unique needs and challenges faced by obese female adults in Kogi State. Additionally, existing studies focused more on either physical fitness outcome or relationship in body composition and other aerobic exercise, rather than investigating the combine effect of those exercise on the participants. Therefore, there is an opportunity for the researcher to fill the gap by investigating the effectiveness of brisk walking training programme tailored to the specific context of body composition, BMI and LMM) of obese female adults in Kogi State.

Purpose of the Study

The aim of this study was to investigate the effect of a twelve-week brisk walking program on BMI and lean muscle mass of obese female adults in Kogi State. Specifically, the study seeks to determine:

1. difference in the mean total body mass index (BMI) of experimental and control groups of obese female adults after a 12-week brisk walking in Kogi State;
2. difference in the mean total lean muscle mass of experimental and control groups of obese female adults after a 12-week brisk walking in Kogi State.

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Research Question

The following research questions guided the study.

1. What is the difference in the mean total body mass index (BMI) of experimental and control groups of obese female adults after a 12- week brisk walking in Kogi State?
2. What is the difference in the mean total lean muscle mass of experimental and control groups of obese female adults after a 12- week brisk walking in Kogi State?

Hypotheses

The following hypotheses have been postulated and were tested at .05 level of significance for this study:

1. There is no significant difference in the mean body mass index of experimental and control groups of obese female adults after a 12-week brisk walking in Kogi State, Nigeria.
2. There is no significant difference in the mean lean muscle mass of experimental and control grc f obese female adults after a 12-week brisk walking in Kogi State, Nigeria.

Methodology

The research design was quasi-experimental design, specifically, the pretest-posttest experimental and control group. A quasi-experimental study is a type of research where the allocation of the participants to different group is not randomized, which distinguishes from true experiment. (Maciejewski, 2018). A quasi-experimental study is a type of research design that examine the causal relationship between an intervention and an outcome without the use of random assignment to treatment or control group. A quasi-experimental design was used in this study to examine how the intervention (brisk walking) affect the participants. The body composition of the subjects were measured before and after the 12week brisk walking training programme which help to compare the change in body composition indices of the participants. The treatment group were engaged in brisk walking and it was three times per week with progressive intensity for twelve weeks and both the groups were tested for all the variables. Two assessments were taken at base-line, and at end of the12th week. The following instruments were used in this study: a sheet for recording measured body composition indices. Physical activity readiness questionnaire (PARQ). Digital stop watch (CASIO) model 015, was used for timing the movement of the subjects during brisk walking programme. Omron body composition monitor with scale fitness indicator and 90-day memory, was used to measure the lean muscle mass. Preliminary survey was done by the researcher and the six research assistant. Ethical clearance was obtained, forms and questionnaire were filled and signed by each participant to indicate their wiliness to participate in the study

Experimental Procedure

Weighing Scale, Model ZT 150A, was used to measure the weight of the participants. Participant weight were measured by the participant stepped onto the measurement platform and placing feet on the foot electrodes with weight evenly distributed. Health scale, Seca 217 Portable Stadiometer, was used to measure the participant's height. It has a platform of 28 cm by 38.5 cm with a height meter rule of 190 cm. Omron full body sensor body composition monitor and scale fitness indicator was used to measure BMI and lean muscle mass was equally measured using Omron Full Body Sensor Body Composition Monitor and Scale fitness indicator. Same standard procedure as in body mass index was followed to ensure accuracy. When the measurement was completed, the indicator in the measurement progress bar at the bottom display gradually and the results were documented.

The training programme was conducted on the track of the St Augustine College Kabba in the morning between the hours of 8.00 and 9.30 a.m. During the initial 4 weeks of training, the participants were trained at intensity levels of between 50 and 55% maximum heart rate (each participant maximum heart rate (HRmax) were determined using the formula: 220 – age), three times per week for a duration of 45 minutes (10 minutes' warm-up and 5 minutes of cool-down and 30 minutes brisk walking). Between the 5th and 8th week, the training intensity level were maintained between 55 and 60% maximum heart rate which was monitored using the Borg's scale rating of 11-13 (light), three times per week and for a duration of 55 minutes (10 minutes' warm-up and 5 minutes of cool-down and 40 minutes brisk walking). Likewise, between the 9th and 12th weeks, the training intensity were further increased to 60 and 65% maximum heart rate using Borg's scale 13 - 15 (somewhat hard) at a duration of 65 minutes (10 minutes' warm-up and 5 minutes of cool down and 50 minutes main training).

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The data collected were analyzed with the use of statistical package for social sciences (SPSS), version 20.0, descriptive statistics of means and standard deviation was used to analyze the data. Analysis of Covariance (ANCOVA) was also used to test the hypotheses and the training effect on the variables at 0.05 Alfa level of significant. Size of effect by Cohen's criterion (1988) stated that, effect size of an exercise that range from 0.00-0.10 is very low effect, 0.20-0.40 is small effect, and 0.50-0.70 is medium effect, 0.80-1.00is large effect and 1.30 and above is huge effect. The p-value for the covariate that is less than the chosen significance level of 0.05, the covariate has a significant effect on the dependent variable, therefore the null hypothesis was accept. Conversely, the p-value that was greater than 0.05, was reject because the covariate does not have a significant effect. Similarly, the p-value for the independent variable(s) that less than 0.05 has significant difference between the group means, therefore the null hypothesis was accepted and the p-value that was greater than 0.05 has no significance difference between the group means, therefore, the null hypothesis was rejected. A statistical measure develops by Cohen's (1955) commonly used to calculate effect size in various statistical test. Small effect = 0.2, medium effect =0.5 and the large effect = 0.8 was adopted for this study.

Results

Research Question One: What is the difference in the mean total body mass index (BMI) of the experimental and control groups of obese female adults after a 12- week brisk walking in Kogi State?

Table 1: Means and Standard Deviations of the Total Body Mass Index (BMI) (kg/m2) of the Experimental and Control Groups of Obese Female Adults after a 12- Week Brisk Walking in Kogi State

Groups		**Pre- Test**		**Post-Test**		**Mean Diff.**
	N	Mean	S.D	Mean	S.D	
Experimental	16	35.88	1.82	25.69	1.08	**-0.81**
Control	16	36.69	1.14	35.13	1.45	**-9.44**
Total	32					

The result as presented in table 1 shows that before treatment the mean body mass index (BMI) of the experimental group was 35 .88 kg/m² with the standard deviation of 1.82 while the mean body mass index (BMI) for the control group was 36.69kg/m² with the standard deviation of 1.14.The body mass index of the experimental group after the treatment was 25.69kg/m² with the standard deviation of 1.08 while the mean body mass index of the control group after the treatment was 35.13kg/m with the standard deviation of 1.45 . The mean difference in the pretest between the experimental and the control groups was -0.81 while in the posttest, it was -9.44 in favour of the experimental group which shows the reduction in the mean body mass index by 4.81 units of the obese female adults after a brisk walking for 12 weeks.

Hypothesis one: There is no significant difference in the mean of the body mass index of the experimental and the control group of obese female adults after a 12 week brisk walking in Kogi State, Nigeria.

Table 2: Summary of Analysis of Covariance of Experimental and Control Groups of Body Mass Index of Obese Female Adults after a 12-Week Brisk Walking in Kogi State

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	395.121[a]	2	197.561	58.696	.000	.658
Intercept	.072	1	.072	.021	.034	.000
Pre –Test	238.871	1	238.871	70.969	.000	.538
GROUP	**2.500**	**1**	**2.500**	**7.224**	**.032**	**.122**
Error	205.316	61	3.366			
Total	76088.000	64				
Corrected Total	600.438	63				

a. R Squared = .658 (Adjusted R Squared = .647)

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Table 2 shows that the mean body mass index of experimental and control groups was F (1, 61) = 7.22, P = 0.03 < 0.05 level of significance and η^2partial =, 0.122. The η^2partial shows that 12% is the proportion of variance in the female adults' body mass index due to the 12- week brisk walking training. Effect size was very small according to Cohen's (1988) guideline, which confirmed the result of table three that gives the mean body mass index difference of - 9.44 in favour of the experimental group. Hence, the null hypothesis and state that there is a significant difference between the female adults in the experimental and control groups was rejected,

Research Question two: What is the difference in the mean Lean Muscle Mass (LMM) of experimental and control groups of obese female adults after a 12- week brisk walking in Kogi State?

Table 3: Mean Lean Muscle Mass of Experimental and Control Groups of Obese Female Adults After a 12 – Week Brisk Walking in Kogi State

Group	Pre – Test		Post - Test		Mean Diff.
	N	Mean	S.D	Mean	S.D	
Experimental	16	27.00	1.37	31.53	1.06	**0.81**
Control	16	26.19	1.38	27.25	1.00	**4.28**
Total	32					

The result as presented in Table 3 shows that in the Pre – Test, the experimental group had the mean Lean Muscle Mass of 27.00 with the standard deviation of 1.37 while the control group had the mean Lean Muscle Mass of 26.19 with the standard deviation of 1.38. Also, Table 8 shows the mean Lean Muscle Mass of the experimental group in the Post –Test as 31.53 with the standard deviation of 1.06 while the mean Lean Muscle Mass of the control group is 27.25 with the standard deviation of 1.00. The mean difference in the post – test between the experimental and control group is 4.28 in favour of the experimental group. This is an indication that the 12 – week brisk walking training increased the mean Lean Muscle Mass of obese female adults in experimental group by 4.28 units.

Hypothesis two: There is no significant difference in the mean Lean Muscle Mass of experimental and control groups of obese female adults after a 12- week brisk walking in Kogi State.

Table 4: Summary of Analysis of Covariance of the Lean Muscle Mass of the Experimental and Control Groups of Obese Female Adults After a 12- Week Brisk Walking in Kogi State

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	368.000[a]	2	184.000	73.365	.000	.468
Intercept	307.088	1	307.088	244.796	.000	.594
Pre-Test	262.938	1	262.938	99.080	.000	..37
GROUP	**602.924**	**1**	**602.924**	**48.059**	**.000**	**.223**
Error	2095.100	61	12.546			
Total	50544.000	64				
Corrected Total	368.000	63				

R Squared = .468(Adjusted R Squared = .461)

Table 4 shows that the mean Lean Muscle Mass (LMM) of the experimental and control groups was F (1, 61) = 48.06, P = 0.000 < 0.05 level of significance and η^2partial = 0.0223 means 22 % is the proportion of the variance in the mean Lean Muscle Mass of the experimental and the control groups in the post-test due to a 12 – week brisk walking training. Effect size was small according to Cohen's (1988) guideline, this confirms the results of table three which gave the mean lean muscle mass of difference of 4.28 in favour of the experimental group. Hence, the null hypothesis and state that there is a significant difference between the mean Lean Muscle Mass of the obese female adults in the experimental and control groups was rejected.

Discussion of the Findings

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Findings of this study showed that, there was a reduction in the total body mass index of the experimental group of obese female adults as a result of 12-week brisk walking in Kogi State, Nigeria. It was also found that, there is a significance difference in the mean BMI of the experimental and control groups following the 12-week brisk walking programme. The finding was expected and not surprising. The finding was in line with that of Iriyani (2022), who investigated the effect of aerobic training (walking and jogging) for five days in a week for a period of 8 weeks which led to reduction in total body mass index of the experimental group. The study also supports the findings of Kingsley (2022), which concluded that, brisk walking exercise led to a decrease in body mass index of obese women in the experimental group.

The finding of this study showed that, there was an increase in the lean muscle mass of experimental group of obese female adults after a 12-week brisk walking programme in Kogi State. There is a significance difference in the mean lean muscle mass of the experimental and control groups following the 12-week brisk walking programme The fingings of this study was in agreement with the findings by Kiara & Nagy, (2017), who maintained that physical fitness can increase muscle mass and reduces fat percentage of obese adults. This finding was also in agreement with a study conducted by Omolara (2018), titled assessment of the effect of brisk walking on anthropometric and body composition indices of obese female adults in Kaduna metropolis, who maintained that brisk walking can increase muscle mass. This finding is consistent with previous studies where aerobic exercise led to increased lean muscle mass by (Chen., 2016 and Melam 2016). The study showed that brisk walking can be beneficial in helping to reduce weight and improve health. Therefore, 12 week brisk walking could increase lean muscle mass.

Conclusion

In line with the findings, the following conclusions were reached. Brisk walking demonstrated a significant effect on the body composition components in terms of the reduction of body mass index but with increase in lean muscle mass of obese female adults in kogi state. Findings of the 12-week brisk walking programme demonstrated a significant effect on obese female adults in Kogi State with experimental group showing more pronouncement reduction in BMI compere with control group. It was therefore concluded that 12-week brisk walking is effective in producing significant increase of muscle mass of obese female adults in Kogi State, Nigeria.

Recommendations

On the basis of the findings of this study, the following recommendations were made:

1. Brisk walking should be prescribed by physical educationist, exercise therapist and exercise physiologist for modification of BMI and lean muscle mass.
2. Individual should develop walking habits and reduce the use of motorized means of transportation to increase the lean muscle mass and also reduce other body composition indices that could lead to obesity

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