EFFECTS OF AEROBIC TRAINING ON BODY MASS INDEX (BMI), RESTING HEART RATE AND BODY WEIGHT ON OBESE WOMEN IN ADAMU AUGIE COLLEGE OF EDUCATION ARGUNGU, KEBBI STATE

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Abstract

Sedentary lifestyle is associated with various negative health outcomes, including obesity. This study was to determine the effects of aerobic training on Body weight, BMI, and resting heart rate on obese women in A. A. C. O. E Argungu. Obese women were identified using their BMI ≥ 30kg/m^2 as experimental and control groups. Experimental research design of pre-test, post-test was used. Thirty (30) participants were selected using purposive sampling technique formed the sample for the study out of which 15 subjects were randomly recruited into experimental and control group. A pre-test was conducted for the two groups to measure the dependent variables at baseline. Aerobic exercise training was administered to participants in the experimental group while control group were left to carry out their normal activities. A post-test was conducted for the two groups after the training to determine the effects of the exercise on BMI, resting heart rate and body weight of participants. Hypotheses were formulated and tested using inferential statistics of t-test at 0.05 level of significance. The findings revealed a significant difference on BMI, body weight and heart rate on the experimental group. It was concluded that aerobic training improved body weight and BMI of obese women. Therefore, recommended that obese women should participate in aerobic training in other to eliminate cardiovascular risk factors.

Keywords: *Aerobic training, Body Mass Index, Obese Women, Resting Heart Rate*

Introduction

Overweight and obesity are increasing at alarming pace due to urbanization, changes in lifestyle and adoption of modern technologies. With the advent of modern technologies in this era of computerization people tends to be less physically active. Modern trends in society like online shopping and digitization of work has led to consequences like overweight and obesity (Suman, 2016). World Health Organization (WHO) has defined overweight and obesity as 'abnormal or excessive fat accumulation that may impair health. According to the World Health Organization (WHO), obesity is one of the most common public health problems in both developed and developing countries (WHO, 2000). In developing countries, obesity is attributed by several factors like increasing urbanization, use of mechanized transport, increasing availability of processed and fast foods, increased television viewing, adoption of less physically active lifestyles and consumption of more "energy-dense, nutrient-poor" diets.

It is an established fact that obesity and overweight lead to several diseases e.g. hypertension, diabetes and cardiovascular disease. Obesity reduces vascular compliance and work with the stiffness and hardness and increased resistance to blood vessels in the long term (Cooke & Oka, 2002). On the other hand people tends to be more physically fit and active by performing different types of activities like exercise, walking, jogging, yoga etc. Aerobic exercise is considered one of the best exercises to reduce

body weight and body mass index (BMI). Any physical activity which requires increased oxygen intake is an aerobic exercise. According to American College of Sports Medicine (ACSM), aerobic exercise is defined as "any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature." Aerobic exercise is considered one of the best exercises to reduce body weight and body mass index (BMI). Any physical activity which requires increased oxygen intake is an aerobic exercise. Aerobic exercise includes walking, cycling, jogging, running, swimming etc. The term 'aerobic' and the specific exercise method were developed by Kenneth, Cooper, an exercise physiologist, and Col. Pauline Potts, a physical therapist both from USA. There are many benefits of regular exercise (Andersen & Jakicic, 2009).

Empirical Studies on Overweight and Obesity

Literatures have shown that overweight and obesity are among the most common and serious health problems in modern society. According to the World Health Organization (2000), there are about 1.6 billion overweight adults with a Body Mass Index (BMI) above 25 kg/m^2 worldwide. At least 400 million of them are obese, with a BMI above 30 kg/m^2. Body fat percentages, as well as BMI, have both been identified as factors responsible for the reduced physical fitness levels, among young populations (Artero, España-Romero, Ortega, Jiménez-Pavón, Ruiz & Vicente-Rodríguez, 2010). It is also observed that over the past few years, excess body weight (manifest as over-weight and obesity) has become significantly more prevalent in developed and developing nations (World Health Organisation, 2004). One possible way of avoiding these health risk prevention of over-weight and obesity, however, lifestyle changes brought about by technological advances, such as sedentary behaviour, inadequate dietary habits and stress, make prevention of excess body weight very challenging (International Obesity Task Force, 2005.

Statement of the Problem

Automation has modified the need for physical activities. Elevators, automobiles, two and four wheelers and the likes have replaced walking, cycling and other natural exercises in the lives of individuals. Competition in every field has created a tendency towards more brainwork than physical work for large group of people. This Physical neglect caused by this, is resulting in obesity in most cases. There is also little research document on the effects of aerobic training on the BMI and resting heart rate of overweight women in A. A. C. O. E Argungu, Kebbi State. It was therefore on this established basis, the researcher aimed to study the effects of aerobic exercise on BMI and heart rate on obese women in A. A. C. O. E Argungu, Kebbi State.

Research Questions

The researcher therefore attempted to answer the following research questions;

1. What will be the effect aerobic training on BMI on obese women in A. A. C. O. E Argungu?
2. What will be the effect of aerobic training on resting heart rate on obese women in A. A. C. O.E Argungu?
3. What will be the effect of aerobic training on body weight on obese women in A. A. C. O. E Argungu?

Hypotheses

1. Aerobic training will not have any significant effect on the BMI on obese women in A. A. C. O. E Argungu.
2. Aerobic training will not have any significant effect on Resting Heart Rate on obese women in A. A. C. O. E Argungu.
3. Aerobic training will not have any significant effect on body weight on obese women in A. A.

C. O. E Argungu.

Aim and objective of the study

This study investigated the effects of aerobic training on the body mass index (BMI), resting heart rate and body weight on obese women in A. A. C. O. E Argungu of Kebbi State with the view to reduce body weight and body mass index (BMI).

Methodology

The aim of this study was to investigate the effects of aerobic training on body mass index, resting heart rate and body weight on obese women in A. A. C. O. E Argungu of Kebbi State. The researcher adopted an experimental research design of pre-test and post-test intervention involving experimental and control groups which was designed to determine the changes produce as a result of the aerobic training program. This is in conformity with the method advanced by Jerry, Jack and Stephen (2005).

The population for this study comprised all obese women in A. A. C. O. E Argungu, Kebbi State.

Women who had BMI of $25 \geq 30 kg/m^2$ were selected for the study. Out of the total population, thirty (30) middle-aged obese women that satisfied the inclusion criteria were randomly selected to participate in the study through judgmental (purposive) sampling procedure.

A sample size of fifteen (n=15) participants were assigned into each group (experimental and control groups) using a balloting procedure of 'Yes' or 'No' written on a piece of papers. All subjects who picked 'Yes' formed the experimental group, while those who picked 'No' formed control group respectively. This is in consonance with Peretomode and Ibeh (1992), who recommended that 15 subjects per group an experimental research may be valid. To avoid contamination of the study, the experimental group was secretly informed to be coming for the training program at A. A. C. O. E permanent site mini stadium every evening while the control group was allowed to continue their normal businesses.

Warm-up exercises were given to participants in experimental group before engaging them in the aerobic exercise programme which consisted four (4) sessions per week and each session of 60 minutes. At the end of the training program, 10 minutes of cool down exercise was prescribed. Aerobic exercises such as walking and jogging were administered. Dependent variables (body weight, heart rate and BMI) were measured at the end of the training programme.

Data Analysis

Descriptive statistics of percentage mean and standard deviation was used to organize the demographic baseline characteristics of subjects. The data was analyzed by IBM SPSS Statistics software Inc., version 20.0 (Armonk, NY: IBM Corp.) Body weight and body mass index and resting heart rate were selected as dependent variables. Shapiro-Wilk test was applied to check whether data is normally distributed or not. As the data were normally distributed, independent t test was used to compare means of experimental group and control group to test all the formulated hypotheses at 0.05 level of significance.

Results

Table 1: Physical and Physiological Data of Respondents

Variables	N	Mean	S. D
Age (yrs.)	30	36.17	2.43
Height (cm)	30	160.19	6.82
Weight (kg)	30	92.48	9.75
BMI (Kg/m^2)	30	31.09	3.18
Resting Heart Rate (bpm)	30	85.34	4.31

Table 1 above shows that the participants had a mean age of 36.17 years, mean height of participants was 160.19cm. It can also be observed from the table that the participants had a mean weight of 92.48kg, a mean BMI of 31.09kg/m^2 and a mean resting heart rate of 85.34 bpm.

Hypothesis 1: Aerobic exercise will not have significant effect on the body mass index on obese women in A. A. C. O. E Argungu.

Table 2: t-test summary of independent sample on Body Mass Index (BMI) by groups

Exp. Group	Mean	S. D	t-cal.	Remark
BMI Pre Test	31.87 kg/m^2	2.72	3.091	Significant
BMI Post Test	26.04 kg/m^2	2.68		
Control Group	**Mean**	**S. D**	**t-cal.**	**Remark**
BMI Pre Test	33.34 kg/m^2	4.81	1.309	Not Significant
BMI Post Test	33.09 kg/m^2	6.63		

t = 2.14; Sig. df =14, P<0.05

An independent t-test was calculated to compare the mean of experimental scores with mean of control scores. The table revealed that, the mean of experimental scores was 26.04 kg/m^2, and means scores of control group was 33.09 kg/m^2. The observe t-calc value of 3.091 is greater than the t-crit value of 2.14 at 0.05 level of significance for the experimental group pre-test and post-test while the t-calc value of 1.309 is less than the t-crit value of 2.11 for the control group pre-test and post-test. Therefore, the null hypothesis was rejected. This implies that aerobic exercise has a significant effect on the Body Mass Index on obese women in A. A. C. O. E Argungu.

Hypothesis 2: Aerobic exercise will not have significant effect on the Heart Rate on obese women in A. A. C. O. E Argungu.

Table 3: t-test summary of independent sample on Resting Heart Rate by groups

Exp. Group	Mean	N	S. D	Df	t-calc	t-crit	Remark
Resting H.R Pre-Test	88.39 bpm	15	0.9				
				14	3.461	2.14	Significant
Resting H.R Post Test	81.24 bpm	15	0.84				
Control Group	**Mean**	**N**	**S.D**	**Df**	**t-calc**	**t-crit**	**Remark**
Resting H.R Pre-Test	86.09 bpm	15	0.31				
				14	1.349	2.11	Not Significant
Resting H.R Post Test	85.67 bpm	15	0.18				

t = 2.14; Sig. df =14, P<0.05

Comparing mean scores of the experimental group 81.24 bpm and mean scores of the control group

85.67 bpm result showed a statistically significant difference in resting heart rate with t-calc value of 3.461 greater than the t-crit value of 2.14 at a 0.05 level of significance for the experimental group pre-test and post-test while the t-calc value of 1.349 is lesser than the t-crit value of 2.11 for the control group pre-test and post-test. Therefore, the null hypothesis is rejected. This implies that 12-week of aerobic exercise has a significant effect on the Resting Heart Rate of obese women in A. A. C. O. E Argungu.

Table 5: t-test summary of independent sample on Body Weight by groups

Exp. Group	**Mean**	**N**	**S. D**	**Df**	**t-calc**	**t-crit**	**Remark**
Body weight Pre-Test	77.95	15	4.81				
				14	3.051	2.14	Significant
Body weight Post Test	71.20	15	3.34				
Control Group	**Mean**	**N**	**S.D**	**Df**	**t-calc**	**t-crit**	**Remark**
Body weight Pre-Test	77.50	15	3.06				
				14	1.83	2.11	Not Significant
Body weight Post Test	77.35	15	2.88				

t = 2.14 sig. df =14, P<0.05

An independent t-test was calculated to compare the mean of experimental scores with mean of control scores. The table above revealed that, the mean of experimental scores was 71.20 kg and mean scores of control group were 77.35 kg. The observe t-calc value of 3.051 was greater than the t-crit value of 2.14 at 0.05 level of significance for the experimental group pre-test and post-test while the t-calc value of 1.83 was less than the t-crit value of 2.11 for the control group pre-test and post-test. Therefore, the null hypothesis is rejected. This implies that twelve weeks of aerobic exercise has a significant effect on the Body weight on obese women in A. A. C. O. E Argungu.

Discussion of Findings

Several studies have shown that overweight and obesity are detrimental for health. Sedentary life style is one of the predisposing factors of overweight and obesity which lead to several diseases like cardiovascular diseases, hypertension, diabetes etc. This study has shown that aerobic exercise programme is a positive influence on body weight, resting heart rate and body mass index (BMI) on obese women in A . A. C. O. E Argunugu, Kebbi State.

The results of hypothesis testing on effects of aerobic exercise on the body mass index (BMI), resting heart rate and body weight on obese women in A. A. C. O. E. Argunugu, using the inferential statistics of independent t-test concluded that aerobic exercise has a significant effect on the body mass index (BMI) on obese women in A. A. C. O. E Argungu, (t= 3.091 df= 14 P< 0.05*)*. The findings correlates with that of Abass and Moses (2013) who discussed that exercise reduces the body mass index and percentage body fat of individuals. They also showed a decrease in %BF and BMI due to the trainings which indicate ability of the trainings to attenuate unset of excess accumulation of adipose tissues. Rosemary and Jill, (2006) also discussed that brisk walking and aerobics are the best methods for controlling and reducing weight and body mass composition. This finding also agrees with Mariotti, Rossato, Fröehlich and Limberger (2013) who believed other forms of exercise may have a greater impact on body mass index of individuals. For example, emerging research examining aerobic exercise indicates that it may be more effective at reducing subcutaneous and abdominal body fat than other types of exercise. The mechanisms underlying the fat reduction induced by aerobic exercise, however, are undetermined. Regular aerobic exercise has been shown to significantly increase both aerobic and anaerobic fitness. The result of hypothesis testing on effect of aerobic exercise on the resting heart

rate on obese women in A. A. C. O. E Argungu, using the inferential statistics of independent t-test concluded that aerobic exercise has a significant effect on the resting heart rate on obese women in A. A. C. O. E Argungu (t= 3.461 df= 14 P< 0.05). This finding is in consistent with the finding of Fein (2007) who submitted that aerobic training consists of lengthy duration and low intensity which significantly helps in reducing an individual's resting heart rate. Some popular aerobics activities include aerobics dance, biking, cross-country skiing, jogging, walking, and swimming. Most fitness centers also host courses to target certain areas, help participants lose weight, or instruct a specific method of working out. Consistent Aerobics exercise is extremely beneficial to the human body. The consistent breathing strengthens the lungs, keeps the heart at maximum efficiency, and enlarges the heart muscle. This allows it to pump more blood with less effort, so it reduces the resting heart rate. A healthy heart benefits the body's blood circulation and blood pressure. This naturally increases the red blood cell count, which helps the blood transport oxygen throughout the body. Over time, muscles will build endurance because they will be increasing their storage of fats and carbohydrates for energy. Muscles will be able to train harder and for longer periods of time (Kelly, 2012).

The result of hypothesis testing on effect of aerobic exercise on body weight on obese women in A. A. C. O> E Argungu, using the inferential statistics of independent t-test concluded that aerobic exercise has a significant effect on the resting heart rate on obese women in A. A. C. O> E Argungu (t= 3.051 df= 14 P< 0.05). Our findings was consistent with the finding of Nicklas et al, (2009) who recommended 30 minutes of activity most days a week to treat obesity. Aerobic exercise combined with controlled diet may cause further reduction in fat mass, when compared to using diet only. Aerobics increases capability of our body to use fat as a substrate and total fat oxidation increases during the process. Studies have shown that regular exercise helps to reduce TG, TC, LDL, BMI, body mass, body fat and increase HDL, body mass, and BMR (Talanian, Galloway, Heigenhauser, Bonen, & Spriet, 2007). According to De Souza e Silva, de Souza Rabelo, Vale, Ferrão, Gonçalves, & de Sá Rego Fortes, et al. (2009) waist circumference decreased in people who adhere to diet and aerobic exercise for 60 to 90 minutes in 5 to 7 days a week due to the increase in VO^2max and HDL levels. Most of the studies recommend aerobics compared to other type of exercise because physical activity significantly reduces body fat content for the treatment of heart disease. In another study, investigations have shown that aerobic exercise alone results in clinically significant body weight loss in men and women (Joseph, Donnelly et. al. 2013).

Conclusion and Recommendations

Based on the findings of this study, aerobic exercise programme was effective to reduce body weight as well as Body Mass Index on obese individuals. It was therefore concluded that aerobic exercise with appropriate intensity should be recommended to overweight and obese people to reduce body fat. On the contrary, subjects assigned in control group have no significant improvement on the dependent variables. Based on the findings therefore, the following recommendations were proffered

1. Aerobic exercise with appropriate intensity should be recommended to overweight and obese people to reduce body fat.
2. Obese women should embrace aerobic exercise in order to eliminate risk of getting excessive overweight.
3. Aerobic exercise should be introduced to sedentary obese women in order to promote their fitness level and reduce body fat.
4. Aerobic classes for women should be introduced in various local government areas to encourage women participation in aerobic dance exercise.

References

Alves, J.G.B. (2008). Establishing a standard definition for child overweight and obesity Worldwide: International survey. *British Medical Journal, London, vol.320 (72): pp.124-127*

American Council on Exercise (2009). ACE's Essentials of Exercise Science for Fitness Professionals.

Awopetu, A.R. (2005). Illustrated book of fitness and aerobic exercises. Lagos: Prints and solution limited.

Ben Ounis, O. (2008). Effects of two-month physical-endurance and diet-restriction programs on lipid profiles and insulin resistance in obese adolescent boys. *Diabetes and Metabolism, France, vol.34 (6): pp.595-600*

Birch, A.M. (2009). Discovery of a Potent, Selective, and Orally Efficacious Pyrimidinooxazinyl Bicyclooctaneacetic Acid Diacylglycerol Acyltransferase-1 Inhibitor. *Journal of Medicinal Chemistry, Easton, vol.52 (6): pp. 1558-1568*

Candido, A.P. (2009). Cardiovascular risk factors in children and adolescents living in an Urban area of southeast of Brazil: *European Journal of Pediatrics, Berlin. Vol.168 (11): pp. 1373-1382*

Carrel, A.L. (2005). Improvement of fitness, body composition, and insulin sensitivity in Overweight children in a school-based exercise program: a randomized, controlled study. *Archives of pediatrics and Adolescent Medicine, vol 159 (10): pp. 963-968*

Cooke, J.P., & Oka, R.K. (2002). Does leptin cause vascular disease? Circulation.;106: 1904– 05.

International Obesity Task Force. (2005). Preventing childhood obesity. British Medical Association. Board of Science.

Joseph E., & Donnelly et. al. (2013). Aerobic exercise alone results in clinically significant weight loss for men and women: Midwest Exercise Trial-2. Obesity (Silver Spring). Mar; 21(3): E219–E228.

Kang, H.S. (2004). Physical training improves insulin resistance syndrome markers in obese adolescents. *Medicine and Science in Sports and Exercise, Madison, vol.34 (12): pp. 1920-1927*

Leite, N. (2009). Effects of physical exercise and nutritional guidance on syndrome in obese adolescents . *European Journal of pediatrics, Berlin. Vol.13 (1): pp.73-81*

Moran, R, (1999). Evaluation and treatment of childhood obesity: *American Family Physician, 5(9): pp. 861-873*

Netto-Olivera, E.R. (2010). Metabolic and cardiorespiratory responses relative to the anaerobic threshold. *Journal of Medicine and Science in Sports and Exercise: Madison. Vol. 21 (2): pp.191-198*

Park, S.K., Park, J.H., Kwon, Y.C., Kim, H.S., Yoon, M.S., & Park, H.T. (2003). The effect of Combined aerobic and resistance exercise training on abdominal fat in obese middle-aged women. *Journal of Physiology Athrop. And Appl. Human Science, vol.22 (3):* pp.129-135

Peretomode, V.F., & Ibeh, J. (1992). Research methods in education: Johnson Publishing Company limited, Lagos

Quetelet A. 1835. A Treatise on man and the development of his faculties. New York: Rosser printing.

Shahana A., Usha S.N. and Hasrani S.S. 2010. Effect of Aerobic exercise program on Health Related physical fitness components of middle Aged women Br. J. Sports Med. B 4 (4): 19-23.

Suman C. (2016). Aerobic exercise programme and reduction in body weight and body mass index (BMI). Galore International Journal of Health Sciences & Research; 1(1): 41-44.

Thomas, J.R., & Nelson, J,K. (1990). Research methods in physical education (2nd ed,) USA: Human Kinetics.

World Health Organization. (2004). WHO. Global strategy on diet, physical activity and health. Geneva.