

# EFFECT OF 8-WEEK CONTINUOUS AEROBIC EXERCISE ON BODY COMPOSITION OF MALE ADOLESCENT STUDENTS IN DAWAKIN KUDU, KANO STATE

By

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## Abstract

*Several epidemiological studies have shown an inverse relationship between the level of fitness and cardiovascular risk profile in adult population and have also reported that endurance training in this population can reduce the risk factors. The objective of this study was to determine the effect of eight week continuous aerobic exercise on body composition variables of male adolescent secondary school (SS) students of G.S.S. Yankatsari, Dawakin Kudu (DKD) Local Government Area (LGA), Kano State. Population consisted of all the adolescent boys between the ages of 14-18years (n =1,200) in G.S.S Yankatsari DKD. 60 male adolescent were randomly sampled and assigned into A&B 30 each. Group were subjected into 8-weeks continuous aerobic exercise (n=30) which is low training modes, of continuous aerobic exercise. it preceded by warm up activities including running, jumps, side Stretch, waist bend, and brisk walking with a view to elevate the body temperature and physiological functions. while B group (n=30) as control. Anthropometric profiles measured were % BF, FP and LBM. null hypotheses were formulated and tested at an alpha level of 0.05. Analysis of Variance One way (ANOVA) determined the significant differences between the 2 groups. Result revealed that 8-week continuous aerobic exercise elicited significant changes in body composition by improving (reduced) % BF of the Experimental group from (9.4105±2.14 to 5.49±1.39), it also significantly changes body composition by improving (decreased) the body FP of the Experimental group from (41.7435±.18 to 41.4160±108) and improve LBM (42.13±7.99 to 41.7±18) compared to control group. Kano State ministry of Education should collaborate with Health professionals and exercise scientists to help create additional services to adolescent students in schools with a view to engage in exercises for maintaining desirable body composition which can lead to healthier living.*

**Keywords:** Continuous Aerobic Exercise, Body Composition, Male Adolescent

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## Introduction

Aerobic exercise is an activity involving exertion of large muscle groups of the body while performing the activity such as walking, jogging, running and so on. Aerobic exercise is repetitive and rhythmic in nature (Plowman and Smith, 2003). It refers to types of exercises that require oxygen to burn fat stores for energy. It can usually be done for a period of 15 to 20 minutes or longer while maintaining 60-80% of your maximum heart.

Aerobic exercise plays an important role in both primary and secondary prevention of cardiovascular disease (Plowman and Smith 1995). It increased resistance to fatigue, extra energy and stamina, toned muscles and increased LBM, decreased tension and stress and improved quality of sleep. High intensity aerobic exercise increases cardiovascular and respiratory function. Moderate intensity exercise for lowering blood pressure is between 40%-60% of maximal oxygen consumption (VO<sub>2</sub> max) for 30-45 minutes. moderate intensity exercise but not of mild or high intensity exercise raises endothelium dependent vasodilation in healthy subjects. For healthy adults to develop and maintain cardio respiratory fitness, the intensity needs to be between 50% and 80% VO<sub>2</sub> max (Neiman, 2003).

Aerobic capacity improves at 70% of maximal heart rate (50-55% VO<sub>2</sub> max). The greater the relative training intensity (above threshold), the greater the improvement (McArdle, Katch and Katch 1991). More vigorous exercise is needed confer its health benefits (Robergs and Ketayian, 2003). Vo<sub>2</sub> max increase as a result of aerobic exercise (Gaya, Mshelia, and Sansui, 2002; Hagbag, Musa and Adeniran, (1996). Aerobic exercise produce favorable physiological changes that decrease the risk of heart attack and increase the pumping capacity as well as favorable effect on most of the other risk factors for coronary artery diseases.

Continuous exercise refers to a running at relatively low intensity for a long period. Mathew and Fox (1979) Continuous Slow-running at relatively 50% -60% of maximal heart rate (20-30% of V<sub>02</sub> max), and Continuous- Fast - running at relatively 60 -70% of maximal heart rate (36-52% of V<sub>02</sub> max). In both Classifications, the aerobic system is predominant source of energy and therefore, Continuous exercise develops endurance Capacity. This means sustaining a constant tempo of activities for 15 minutes or more. However, Continuous exercise is Popular among joggers, fitness enthusiasts, and Competitive athletes. This exercise assumed to produce the largest aerobic adaptation (Ehsani 1991). Continuous exercise, particularly low to fast is safer, more comfortable, has lower dropout rate, and is better suited to individual initiating aerobic exercise programme (Pollock and Willmore, (1993).

Body composition variables are the structural components of the human body which include percent body fat (% BF), fat mass, LBM and the bone stature. A theoretical model consisting of the average physical dimensions obtained from measurement of people aged 20-24 years through anthropometric survey, a gross composition of reference man and woman in term of muscle, fat and bone was formed. The determining variables of which include age, stature, muscles mass, total fat, essential fat, bone and LBM, it was observed that the reference man is taller, heavier has heavier skeleton, larger muscles and lower total body fat than reference woman (McArdle et al, 1991). The major concern with body composition is the enlargement of the body total fat tissue; the upper limits of normalcy with regard to 'Desirable' levels of body fat are below 19% for male and below 25% for females. Desirable in this context is the fatness level that is compatible. There is complete saturation of adipose cells with lipids and further cellular proliferation leading to increase in body weight (Hammond, 1985).

Several epidemiological studies have shown an inverse relationship between the level of fitness cardiovascular risk profile in adult population and have also reported that endurance training in this population can reduce the risk factors (Venkateswarlu, 1991). However, there is therefore a need for SS students to be fit in order to improve their fitness, controlling and

reducing body fat and maintaining desirable body composition, using Continuous mode of exercises. It is against the background that this study was conducted to determine the effect of 8-week continuous aerobic exercise on body composition of male adolescent students in Dawakin Kudu (DKD), Kano state.

The effect of aerobic exercise on body composition variables such as %BF, FP, LBM of adult population has been attested beyond any doubt (Adeyanju, 2005). However, researchers have debated on whether adolescent body composition variable such as %BF, FP, LBM would be improved and modified following continuous exercise programme of training. A number of reasons have been advanced to justify the variation such as ages difference and lifestyles. Musa and Toriola (2002) Despress, Boucherd and Malina, 1990) revealed that children and adolescent do not suffer high level of mortality rate due to coronary heart diseases (CHD) but they have shown to develop some risk factors.

In Nigeria, there is evidence that hypertension and related over fatness identified at an early age in SS adolescents were due to lack of definite participation in physical education programme in the school system. In addition adolescents in the present dispensation cannot afford to feed well and it is obvious that exercise is energy demanding, they remain in active, thereby, living sedentary life that hampers fitness.

Scientific research evidence has been inconclusive on the best type of training programme for improving physiological attributes of an individual that will consequently improve the general physical fitness and health. Emiola (1986) found that several studies have used different training programmes in order to determine their effects on fitness and health. However, research on the efficacy of continuous aerobic exercise on adolescent male SS students was insufficient .Therefore; there is need to improve SS students' exercise habits, with a view to attaining physical fitness and desirable body composition through properly structured exercise programmes. It is against this background that this study was under taken to determine the effect of 8-week continuous aerobic exercise on body composition of male adolescent students in terms of body fat of male adolescent %BF, fat patterns (FP) of male adolescent and on lean body mass (LBM)of adolescents.

### **Research Questions**

- i. Will there be a significant difference between the effect of continuous aerobic exercise on %BF, body FP, and LBM composition of male adolescent SS students?
- ii. Will eight week continuous aerobic exercise elicit significant effect on %BF of body composition of male SS adolescents?
- iii. Will eight week continuous exercise elicit significant effect on body FP of body composition of male secondary school (SS) adolescents
- iv. Will eight week continuous exercise elicit significant effect on LBM of body composition of male SS adolescents?

### **Significance of the Study**

The outcome of the study is expected to provide useful information / Data on %BF, FP and LBM of adolescent male SS students, in DKD LGA Kano State prior to and after training. The study was expected to be of importance to coaches, physical educators and exercise and wellness professionals, games masters, ministry of youth and sports and Kano State ministry

of education in general to intensify effort in designing and organizing programmes of fitness for health and wellness for adolescent students in SS. The study was delimited to male adolescent SS students of G.S.S Yankatsari, DKD local government area Kano state, aged 14- 18years. The independent variable is continuous exercise while the dependent variables were %BF, body FP and LBM.

### **Methodology**

The pretest and Posttest design was conducted, dependent variables such as %BF, body FP and LBM were measured to determine the changes produced by the treatment (exercise). Population for the study comprised all adolescent boys aged 14-18 years (n 1,200) in G.S.S.Yankatsari, DKD Local government area, Kano State. Samples of sixty (60) male adolescent students were selected for the study by stratified sampling techniques. Selected samples subject were assigned randomly into 2 groups A (experimental) & B (control) representing continuous aerobic exercise group and control group of twenty subjects respectively.

The research instrument include: 1. Portable bathroom weighing scale (Hanson scale model B1801) to determine the body weight of the subject in Kilogrammes 2. Stadiometer: the Holton model NJO7072 to measure subject height in meters. 3. Skin fold calipers: A calibrated skin fold caliper with a constant pressure model M148170 to measure skin fold thickness (Maud and Foster 1995). 4. Measuring Tape Non elastic horse brand Model 211542 tape to measure anthropometric variable. Such as waist to help get measurement (Circumference) in Centimeters (Plowman and Smith 1997)A standard 400m track. 5. A stop watch Kenko Professional Quartz Timer (KK 5898, China) for Timingthe athletes.

### **Training Protocol**

Training programme involved low training modes, of continuous aerobic exercise. The exercise programme was preceded by warm up activities which included running, jumps, side Stretch, waist bend, and brisk walking with a view to elevate the body temperature and physiological functions. Similarly, cool down exercises were performed after each training session which entailed activities like mild walks, floor finger touch, thigh, arm and shoulder stretch. The aim was to restore the body physiology to normal. Subjects in the experimental group were to participate in jogging programme three times a week for 8-weeks. The training was done differently among the experimental groups, but at the same time on a (Standard 400 meters track) at G.S.S. Yankatsari.

### **Method of Data Analysis**

The descriptive statistics (meanand standard deviation) were used to analyze the physical characteristic and baseline data (pre- training and post training result) of the subjects inferential statistics of Analysis of Variance's One Way (ANOVA) was used to determine the difference between the experimental and control groups in pre and post treatment measures of the dependent variables. Where significant difference is obtained, the scheffe post hoc analysis was used to locate the point of difference. All hypotheses were tested at 0.05 alpha level of significance.

## Result

Table 1: Baseline characteristics of subjects

Variables	Continues (N=30)		exercise	Control (N=30)	
	X	S		X	S
Age (yrs)	16.2	±1.40		16.40	±1.60
Weight (kg)	48.65	±8.98		60.05	±8.34
Height (M)	1.59	±1.1		1.63	±1.3
%BF	9.41	±3.14		10.71	±3.52
% BF (posttest)	5.48	±1.38		10.71	±3.52
Fat pattern	41.74	±0.17		41.78	±0.33
Fat pattern (posttest)	41.41	±0.10		41.78	±0.33
LBM	45.37	±9.82		53.91	±6.69
LBM (posttest)	42.17	±7.10		53.91	±6.69

$H_{01}$ : there was no significant difference among the subject in the experimental and control group for their respective body fat pattern

Table 2 Analysis of variance (ANOVA) table of difference among the subject in the experimental and control group for their respective body fat pattern

Source	df	sum of squares	mean of squares	F	P
Between group	2	2.606	1.803	27.572	.000
Within group	57	2.694	0.47		
Total	59	5.299			

Table 2, shows that the null hypothesis was rejected p-value .000 less than 0.05 alpha level. This means that there was difference among the subject in the experimental and control group for their respective body fat pattern.

$H_{01}$ : there was no significant difference among the subject in the experimental and control group for their respective %BF

Table 3: Analysis of variance (ANOVA) table of difference among the subject in the experimental and control group for their respective %BF

Source	df	sum of squares	mean of squares	F	P
Between group	2	326.914	163.45	27.217	.000
Within group	57	342.327	6.006		
Total	59	669.241			

Table 3, shows that the null hypothesis was rejected p-value .000 less than 0.05 alpha level. This means that there was difference among the subject in the experimental and control group for their respective body %BF.

H<sub>02</sub>: there was no significant difference among the subject in the experimental and control group for their respective LBM

**Table 4: Analysis of variance (ANOVA) table of difference among the subject in the experimental and control group for their respective LBM**

Source	df	sum of squares	mean of squares	F	P
Between group	2	1649.217	819.608	13.111	.000
Within group	57	3563.161	62.512		
Total	59	5202.378			

Table 4 shows that the null hypothesis was rejected p-value .000 less than 0.05 alpha level. This means that there was difference among the subject in the experimental and control group for their respective LBM after 8-week exercise

H<sub>05</sub>: there was no significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective body fat pattern

**Table 5: Analysis of t-test table of significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective fat pattern**

Test	df	X	SD	t	Sig
Pre test	19	.32750	±.18582	7.479	.000
Posttest		.23585	±.41915		
<b>*p-value &lt;0.05</b>					

Table 5, shows that t-test implies that there was difference between pre test and posttest on the subjects' fat pattern after 8-week exercise. Hence, the null hypothesis was rejected

H<sub>03</sub>: there was no significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective %BF

**Table 6: Analysis of t-test table of significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective %BF**

Test	df	X	SD	t	Sig
Pre test	19	3.93400	±2.55761	6.861	.000
Posttest		2.72700	±5.12100		
<b>*p-value &lt;0.05</b>					

Table 6 shows that t-test implies that there was difference between pre test and posttest on the subjects' %BF after 8-week exercise. Hence, the null hypothesis was rejected

H<sub>04</sub>: there was no significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective LBM

**Table 7: Analysis of t-test table of significant effect of 8-week continues aerobic exercise among the subject in the experimental for their respective LBM**

Test	df	X	SD	T	Sig
Pre test	19	3.25250	±6.10390	2.383	.028
Posttest		.49579	±6.10921		
<b>*p-value &lt;0.05</b>					

Table 7, t-test implies that there was difference between pre test and posttest on the subjects' LBM after 8-week exercise. Hence, the null hypothesis was rejected

## Discussion

The study was to determine the effects of eight weeks continuous aerobic exercise on body composition variables of adolescent male SS students of G.S.SYankatsari, DKD Local Government Kano State. The mean baseline %BF of the students in the Experimental group and the Control group was (9.4105±3.14121,9.1830±3.94028 vs 10.7195±3.52). Studies on body composition of SS Students have reported similar mean values of %BF. Pentlic, Milanovic, Sporis and Stojanovic- Tomic, (2012), reviewed 32 studies on the influence of continuous and intermittent exercise on body composition of adolescents, they have come across positive changes in body mass and overall fatty tissues in the experimental group (20.37% compared to 22.66%), which was statistically significant (p<0.05). Aerobic exercise is a useful form exercise for loss of body mass and fatty tissues of the adolescents (Shimamoto et al, 1998).

The study found a significant improvement in FP in the Experimental groups. A significant difference was also shown when compared with the Control group. The study showed that FP of the Experimental groups improved (reduced) significantly from baseline (41.4160±108, 41.5070±.15 vs 41.7815,P>0.05) over 8-week continuous aerobic exercise. The improvement also indicated that aerobic exercise programme has significant influence (P>0.05) on the reduction of regional and overall sum of percentage of body fat and body weight of adolescents as confirmed by Gubiani and Pires Neto (2006). Adewumi and Amusa (1992). Toriola (1994) recorded significant reduction in body FP of their experimental groups after 8-week continuous aerobic exercise. Sung, Yu, Chang, Mo, Woo and Lam (2002) also reported significant decrease in body FP following a programme of circuit training.

The study showed that there was a significant reduction in LBM from baseline (42.1270±7.99, 44.7635±8.88,vs 53.90±6.69). Varess et, al (1990) have proven in their study that programmed aerobic exercise can contribute to qualitative changes to the anthropometric characteristics of the body especially a decrease in fat free mass of the experimental subjects. The study agrees with the study by (Pollock,and Willmore,1990; Willmore and Costill,1994).which found significant reduction in LBM of the experimental groups after programmed aerobic exercise. Also Despres, Bouchard, Trebly, Savard and Marcotte, (1985) as reported by Heyward 1998; that a 20 week Continuous has significantly reduced body weight, %BF and fat cell weight in a group of sedentary adolescents. The study is in contradicts findings reported by Jackie, Marcus, Gallagher and Napolitano (2003) in which 184 subjects were randomly selected; participants completed 12 months of treatment and concluded that no differences were found in body weight based on exercise duration and

intensity. This may be attributed to the energy intake and energy expenditure and the initial fitness of the subjects. Wilmore, Royce, Grandola, Katch and Katch (1970) as reported by Heyward (2000) that a 10 week jogging program (three times per week), which produced significant decrease in total body weight and %BF .

The present study found a significant difference in %BF, between the Experimental and the Control group ( $P > 0.000$ ), this is in line with the study of Blair et al, (2006) confirmed that aerobic exercise at an intensity of 60% - 80% of maximum heart rate and frequency of three times a week has led to statistically significant improvement (decreased) in body composition variables of the experimental subjects. Also, this study indicated statistically significant differences between the experimental and the control group with regards to changes in FP and distribution of fat, coupled with the reduction in total body fat.

An interesting finding of the study was the decrease in LBM between the subjects in the experimental groups and those in control group ( $P > 0.000$ ) after 8-week of continuous exercise. Lohman (1992) reported similar results in a study involving 28 subjects who participated in eight week continuous aerobic exercise recorded slight decrease in total fat percentile and LBM content and also improvement in body composition.

Based on the findings of this study it was concluded that:-

- i. 8-week continuous aerobic exercise elicited significant changes in body composition by improving (reduced) %BF of the Experimental group from  $(9.4105 \pm 2.14$  to  $5.49 \pm 1.39)$ .
- ii. Eight week continuous aerobic exercise significantly changes body composition by improving (decreased) the body FP of the Experimental group from  $(41.7435 \pm .18$  to  $41.4160 \pm 108)$  compared to that of the control group.
- iii. The Experimental group was significantly different after 8-week continuous exercise on LBM ( $42.13 \pm 7.99$  to  $41.7 \pm 18$ ).

## **Recommendations**

The following recommendations were made based on the outcome of this study:-

- i. The finding of this study indicated that continuous aerobic exercises produces significant decrease in %BF, FP and LBM. ( $P > 0.05$ ) It is therefore, recommended that the Kano State ministry of Education should collaborate with Health professionals and Exercise Scientists) to help create additional services to adolescent students in schools with a view to engage in exercises for maintaining desirable body composition which can lead to healthier living.
- ii. Continuous exercises according to the findings of this study was effective in decreasing total body weight of the Experimental groups when compared to that of the Control group as such this study also recommended SS adolescents should participate in health enhancing fitness activities to develop desirable body weight.

## **Suggestion for Further Studies**

Interested investigators can explore the following areas of research:

- i. Studies should be conducted to determine the effect of different modes of exercises on body composition variables of male adolescent students.
- ii. Studies should be carried out on large population of SS students and young adults so as to encourage mass participation and promote physical fitness and wellness.

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