UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.7;
https://unijerps.org
2021 Impact Factor: 5.641; 2020 Impact Factor: 5.355. January-June, 2021
Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363

ACADEMIC JOURNALS
expand your knowledge
http://www.academicjournals.org

IMPACT OF CIRCUIT TRAINING EXERCISE ON CARDIOVASCULAR VARIABLES OF FEMALE SECONDARY SCHOOL TEACHERS IN ANAMBRA STATE

Dr.Ujuagu, N.A, Prof O.C Ogu Dr.Uzor, T.N
na.ujuagu@unizik.edu.ng
oc.ogu@unizik.edu.ng
tn.uzor@unizik.edu.ng
08060763070, 080666210, 0808034178870

Offordile, H
hn.offodile@unizik.edu.ng
09037892071

Abstract

Regularphysical activity and good fitness is an important health priority to national agenda development in the life of women especially teachers. This study was designed to determine the impact of circuit training exercise on cardiovascular variables of female secondary school teachers in Anambra State. The study was guided by four research questions and four hypotheses. Randomized pretest, posttest control group design were adopted for the study and the population consisted of all the female secondary school teachers in Anambra State. The sample consisted of 60 female teachers from 6 secondary schools in OtuochaEducational Zone. The schools were selected with purposive sampling technique while the 60 female teachers were selected using simple random sampling technique. The instruments used for data collection are as follows – measuring tape, stop watch and gym mats. Eight weeks exercise programme was adopted for the training. Data collected were analyzed using descriptive statistics of mean and mean difference for answering the research questions. The null hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance. The result of the study showed that experimental group recorded lower mean difference scores in most of the variables, There was also significant effects and differences in most variables used in the study ($P<0.050$) hence the exercise training had an effect on the experimental group, showing that hearth rate, systolic and diastolic blood pressure of the experimental group dropped after

training which is good for a physically active person. The researcher therefore concluded that eight weeks circuit training exercise programme had an effect on the variables used in the study and recommends that exercise programmes should be introduced in our schools and be seriously upheld by every teacher in the state and from time to time, exercise programmes of this kind should be sponsored by governments and non-governmental organizations (NGOs) to meet up with the standard of teachers required in this era.

Keywords: Cardiovascular fitness, circuit training, heart rate, blood pressure, maximum oxygen uptake

Introduction

The degree of physical fitness depends upon the individual's state of health, constitution and level of activity, if exerted. Optimal fitness is not possible without regular physical activity. Thus, a fit person has the strength, flexibility, endurance, social and emotional adjustments appropriate for his or her age and sex to engage in daily physical activities without experiencing undue fatigue (Marc, 2017). Cardiovascular fitness is generally considered to be the most important aspect of physical fitness and those who possess reasonable amounts of fitness have a decreased risk for heart disease, reduced risk for premature death, and improved quality of life (Walther 2016). The cardiovascular fitness hypothesis proposes that cardiovascular (i.e.,"aerobic") fitness is the physiological mediator that explains the relationship between physical exercise and improved cognitive performance (*Michelle 2016).* Cardiovascular fitness refers to the physical work capacity of an individual, in the form of amount of oxygen capacity per kilogram of body weight over time (mL/kg/min) (ACSM, 2015); From: Exercise-Cognition Interaction, 2016. Cardiovascular fitness is the best index for assessing a physically fit person. Cardiorespiratory endurance is very important because the more fit the cardiorespiratory system becomes, the healthier the lungs, heart and vascular system will be (Behnken 2014). Kodama (2016) explained that regular cardiovascular exercise promotes fitness and provides additional health and wellness benefits that extend well beyond reducing risks of disease. Lombardo (2017) in his contribution stated that increasing of cardiorespiratory endurance and being

more active in general not only reduces the risk of developing depression, but also decrease stress and anxiety, increases happiness, self-confidence and creativity; and improves memory and mental clarity. According to Ogu, Agbanusi and Umeasiegbu (2007) in Ujuagu (2017) regular exercise has been shown to exert many positive effects on health while many common chronic diseases are consequences of inactivity and sedentary behaviour.

Circuit training is an important aspect in this study because it was used in the training programme. Circuit training programme consists of a number of "stations" where a given exercise is performed usually within a specific time. Once the exercise is completed at one station, the trainee moves rapidly to the next station, performing another exercise also within a prescribed time period. The circuit is completed once the exercise at all stations is performed. The exercise at the various stations consist mainly of weight resistance exercises but running, swimming, cycling, calisthenics and stretching exercises may also be included. Willker (2018) stated that the stations in circuit training are usually placed in a circle to facilitate movement. He also added that circuit training needs to be continuous and rhythmical to benefit the heart and lungs as well as the muscles and it is designed to accomplish many different training goals. Trainers and physical educators have in their amour different training methods that could be employed to achieve fitness. Matt (2019) lists the following methods: interval training, continuous training, circuit training and various modifications of these methods such as repetition, running, sprint training, speed play or fart lek training etc. Whichever mode one decides to employ depends among other things on the desired goals. He also explains that circuit training helps women to achieve their goals and maintain them longer than other forms of exercise or diet.

This study looked at cardiorespiratory variables which are heart rate, blood pressure and maximum oxygen uptake. American Heart Association (2014) defines heart rate, or pulse as the number of times the heart beats per minute, which varies from person to person. Heart rates can easily be determined by auscultation with a Stethoscope or by palpation over the heart, both at rest and during exercise. According to American Heart Association (AHA) (2014), for adults 18 and older, a normal resting heart is between 60 and 100 beats per minute (bpm), depending on the person's physical condition and age. The easiest

places to measure heart rate are on the wrist and neck.

Blood pressure according to More (2013) is the amount of force that the blood exerts against the arterial walls. Blood pressure is determined by two factors the volume of blood forced into the aorta (cardiac output) and the resistance encountered by the blood as it passes through the vessels. It can be either monitored directly by cannulating an artery or indirectly by the arm cuff method sphygmomanometer. Morehouse and Miller (2011) revealed that during exercise the cardiorespiratory system makes various adjustments to cope with the increased demand for blood flow to the working muscles.

Maximum oxygen uptake (VO_2max) was defined by Vercci (2012) as the highest oxygen consumption an individual can attain during physical work or exercise while breathing. Corretelli (2012) observed that oxygen consumption at the beginning of exercise seems to consist of a rapid initial increase. Age is a factor that may influence maximum oxygen consumption. According to More (2013) VO_2max decreases with age beyond twenty years, however, the peak may be maintained with exercise up to 25 years of age.It needs to be pointed out that the role of the teacher is of paramount importance in the education system because she is the custodian of knowledge and it is often said that the standard of education cannot grow beyond the level or standard of the teacher, so teachers cannot perform well in their job of teaching if they are physically unfit. Definite steps should be taken to ascertain the physical fitness of each teacher in our schools, because some of them seem to be out of shape and show laxity in teaching the students and doing other extra curriculum activities and to institute individual remedial and developmental programmes for those that require them, those who are not physically fit. The researcher observed from our schools some laxity in some teachers in executing their job of teaching both academically and in other various extra-curriculum activities. This may be as a result of being physically unfit. This present research seeks to find out ways to improve the situation in order to fill the gap.

Hypotheses

The following null hypotheses were generated:

1. There is no significant difference in the mean resting heart rate of female secondary school teachers who were trained

with circuit training exercise programme (CTEP) and those not trained with CTEP

2. There is no significant difference in the mean resting systolic pressure of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with CTEP
3. There is no significant difference in the mean resting diastolic pressure of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with CTEP.
4. There is no significant difference in the mean maximum oxygen uptake of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with CTEP.

Research Method

The research design used for this study was the randomized pretest – posttest control group design, utilizing a 2 x 2 factorial design, where two groups of subjects are involved, the control group and experimental group. This design is appropriate for this study because it is a true experimental research design.The population of the study consists of all the female secondary school teachers in Anambra State. Whose populations are about 5,975(Department of Planning, Research and Statistics Post Primary School Service Commission Headquarters Awka 2019). The instruments used to collect data for this study includes:

Sphygmomanometer: The Kris-Aloy model stethoscope was used in conjunction with the stethoscope for measuring resting blood pressure of the participant.

Stethoscope: The kris-Aloy model stethoscope was used to measure the heart rate and muscular endurance tests.

Stop Watch: The all-purpose professional electronic alarm stop watch was used to determine running time, heart rate and muscular endurance tests.

Measuring Tape: The non-elastic type measuring 152mm was used to mark off the 400m track into 50m bits.

Step Bench: A sturdy – step bench 40 cm high was used to aid accurate measurement of the sit and reach test, and for the step up circuit of the training programme.

Gym Mats: The sit and reach test and sit-up were used to perform on gym mats. Also all the circuits that require lying down were done on gym mats.

Exercise Protocol

The training session starts with warm – up activities. The circuit training lasted 30 minutes and 4 minutes for cool down stretch. The duration of the circuit training was increase to 40 minutes before the end of the programme, 6 minutes for warm– up stretches or exercises, and 4 minutes for cool down stretch.

All participants in the experimental group (30 female teachers) were divided into 5 groups (6 participants in each group). The groups performed the circuit strength training exercises at the different stations. Each group of participants exercised at each station and will have 1-minute rest between stations. The participants moves from one station to the other in a clockwise direction as soon as the time allotted to each station is over, they were required to go through the 5 stations of the circuit three times with 4 minutes rest between sets. Circuit Training Exercises for week 1, 3, 5 & 7

Station 1
Bench Stepping

Action – The participants stepped up and down a bench 38.9cm high. They performed one set using the same Leg each time, second set using the other leg and alternates legs on each step – up cycle.

Station 2
Sit-up

Action: The participant lied flat on the floor with feet behind wall bars and knees slightly bent, palms clasped behind the head, repeat sit – up with trunk twisting.

Station 3
Modified Push – Up

Action: The participants maintained their body as straight as possible in a raiment position with the arms and balls of the toes supporting the body. The participants flexed the elbows, lowering the body until it almost touches the floor, than raises the back up to the starting position.

Station 4
Abdominal Crunch

Action: The participant's heads and shoulders are off the floor, arms are crossed on the chest, and knees slightly bent. The participant curls up to at least 90^{o} and return to the original position.

Station 5
Rowing, Torso

Action: The participants' partner applies enough pressure on the elbows to

gradually force the arms forward (horizontal flexion) while the participants tries to resist the pressure. Next, they will reverse the action horizontally forcing the arms backwards as the partner applies sufficient pressure to create resistance.

Circuit Training Exercise for Week 2, 4, 6 & 8

Station 1
High knee Jogging
Action: The participants go on a high knee jogging on the spot for the duration of station.

Station 2
Rope Skipping
Action**:** The participants did rope skipping with one leg and later with alternate legs.

Station 3
Crunch (curl-up)
Action**:** Prone lying, palms clasped behind the head, with knees bent, curl up until should blade leave floor, then roll-up to the starting position.

Section 4
Modified Push-up
Action: With the knee bent at right angles and the hands on the floor, the participants lowered her body to the floor until the chest touched the floor and then pushed back to the starting position.

Station 5
Burpee
Action**:** The participants stands with their hands at their sides, she bent her knees and places her hand on the floor in front of foot, she trusted her legs back to a full extended position, a front learning rest position, return to erect position. This process was repeated until the time allotted for the exercise lapsed.

Method of Data Analysis
Descriptive and inferential statistical procedures were used to analyze the data. The mean scores and mean difference for each of the variables pre and posttest was computed and used in answering research questions, and also the null hypotheses was tested at 0.05 level of significance using Analysis of Covariance (ANCOVA) to determine if there was any significance difference in performance of female teachers who were trained and those not trained.

Results
Data in figure1 was used to answer research question one

Table1. Mean difference Scores on the Resting Heart Rate of Female Secondary School Teachers who were Trained with Circuit Training Exercise Programme (CETP) and those not trained.

	Pre-test		Post-test		Mean Difference
Groups	**N**	**Mean**	**N**	**Mean**	
Experimental	30	81.50	30	81.30	0.20
Control	30	80.90	30	86.83	5.63

Table 1 shows that the pretest and posttest mean resting heart rate of female teachers exposed to circuit training exercise programme (experimental group) were 81.50 and 81.30 while that of female teachers not exposed to circuit training (control group) exercise were 80.90 and 86. 83. The mean difference in the resting heart rate for the experimental group was 0.20 and that of the control group was 5.63. This is an indication that teachers trained with circuit training exercise programme (experimental group) had a lower mean difference score than the group not trained with circuit training exercise (control group).

Data in figure 2 was used to answer research question two

Table 2. Mean Difference Scores on the Resting Systolic Pressure of Female Secondary School Teachers Trained with Circuit Training Exercise Programme (CTEP) and those not trained.

	Pre-test		Post-test		Mean Difference
Groups	**N**	**Mean**	**N**	**Mean**	
Experimental	30	113.83	30	112.97	0.86
Control	30	115.93	30	122.27	6.77

The results displayed in table 2 shows that the pretest and posttest mean resting systolic pressure of female teachers trained with circuit training exercise programme(experimental group) were 113.83 and 112.97 while that of female teachers not exposed to circuit training exercise (control group)

were 115.93 and 122.27. The mean difference in the resting systolic pressure for the experimental group was 0.86 and that of the control group was 6.77. This suggests that female teachers not trained with circuit training exercise programmehad higher mean difference compared to their counterparts trained with the programme

Data in figure 3 was used to answer research question three

Table 3. Mean Difference Scores on the Resting Diastolic Pressure of Female Secondary School Teachers Trained with Circuit Training Exercise Programme (CETP) and those not Trained.

	Pre-test		Post-test		Mean Difference
Groups	**N**	**Mean**	**N**	**Mean**	
Experimental	30	75.53	30	75.60	0.07
Control	30	73.27	30	78.53	5.26

Table 3 shows that the experimental group had pretest and posttest resting diastolic pressure of 75.53 and 75.60 while that of the control group were 73.27 and 78.53. This indicates a mean difference of 0.07 and 5.26 for experimental and control groups respectively. The difference in resting diastolic pressure from pretest to posttest was lower for experimental group than control group

Data in figure 4 was used to answer research question four

Table 4. Mean Difference Scores on the Maximum Oxygen Uptake of Female Secondary School Teachers trained with Circuit Training Exercise Programme (CTEP) and those not trained.

	Pre-test		Post-test		Mean Difference
Group	**N**	**Mean**	**N**	**Mean**	
Experimental	30	33.70	30	36.19	2.49
Control	30	30.12	30	31.86	0.26

The data in table 4 show that the experimental group had pretest and posttest resting maximum oxygen uptake of 33.70 and 36.19 while that of the control group were 30.12 and 31.86 . This indicates a mean difference of 2.49 and 0.26 for experimental and control groups respectively. The mean difference in maximum oxygen uptake from pretest to posttest was higher for experimental group compared to the control group.

Null Hypothesis 1

There is no significant difference in the mean resting heart rate of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with (CTEP)

Table 5: Summary of ANOVA Analysis on the Difference in the Mean Score of Resting Heart Rates of the Experimental and Control Groups.

Source of variation	Type III sum of square	Df	F		Partial Eta squared
Corrected Model	4790.199[2]	2	534.256	.000	.949
Intercept	79.293	1	17.687	.000	.237
PRERHR	4330.932	1	966.066	.000	.944
GRP	553.932	1	123.561	.000	.684
Error	255.534	57			
Total	429078.000	60			
Corrected Total	5045.733	59			

a. R-squared = .949 (Adjusted R squared = .948

Table 5 reveals that there is a significant different between the mean resting heart rate of the experimental and control, F (1, 57) = 123.56, P< 0.05, η_P^2= .684. Therefore, the null hypothesis was rejected. This shows that circuit training exercise programme had an effect on the resting heart rate of female secondary school teachers who were trained and it is significant in lowering their heart rate.

Null Hypothesis 2

There is no significant difference in the mean resting systolic pressure of female secondary school teachers who were trained with circuit training exercise

programme (CTEP) and those not trained with (CTEP)

Table 6: Summary of ANOVA Analysis on the Difference in the Mean Score of Resting Heart Rates of the Experimental and Control groups.

Source of variation	Type II sum of square	Df	mean square	F	P	Partial Eta squared
Corrected Model	2.45.337[a]	2	1227.168	48.784	.000	631
Intercept	646.046	1	646.046	25.682	.000	.311
PRERHR	1156.987	1	1156.987	45.994	.000	.447
GRP	958.252	1	958.252	38.094	.000	.401
Error	1433.847	57		25.155		
Total	833909.000	60				
Corrected Total	388.183	59				

Table 6 reveals that there is a significant difference between the mean resting systolic pressure of the experimental and control, F (1, 57) = 38.094, P<0.05, η_P^2= .401. Therefore, the null hypothesis was rejected. This shows that circuit training exercise programme had an effect on the resting systolic pressure of female secondary school teachers who were trained and since the group had a lower mean score, it means that exercise can lower blood pressure.

Null Hypothesis 3

There is no significant difference in the mean resting diastolic pressure of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with (CTEP).

UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.7;
https://unijerps.org
2021 Impact Factor: 5.641; 2020 Impact Factor: 5.355. January-June, 2021
Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363

ACADEMIC JOURNALS
expand your knowledge
http://www.academicjournals.org

Table 7: Summary of ANOVA Analysis on the Difference in the Mean Score of Resting Diastolic Pressure.

Source of variation	Type II sum of square	Df	mean square	F	P	Partial Eta Squared
Corrected Model	3618.473[a]	2	1809.237	672.884	.000	.959
Intercept	36.267	1	36.267	13.488	.001	.191
PRERHR	3489.406	1	3489.406	1297.767	.000	.958
GRP	377.135	1	377.135	140.263	.000	.711
Error	153.260	57				
Total	360128.000	60				
Corrected Total	3771.733	59				

Table 7 reveals that there is a significant difference between the mean diastolic pressure of the experimental and control groups, F (1, 57) = 140.263, P<0.05, η_P^2= .711. Therefore, the null hypothesis was rejected. This shows that circuit training exercise programme had an effect on the resting diastolic pressure of female secondary school teachers who were trained, meaning that exercise can lower blood diastolic pressure.

Null Hypothesis 4

There is no significant difference in the mean maximum oxygen uptake of female secondary school teachers who were trained with circuit training exercise programme (CTEP) and those not trained with (CTEP).

UNIJERPS
Unizik Journal of Educational Research and Policy Studies VOL.7;
https://unijerps.org
2021 Impact Factor: 5.641; 2020 Impact Factor: 5.355. January-June, 2021
Indexing and Impact Factor URL: http://sjifactor.com/passport.php?id=21363

ACADEMIC JOURNALS
expand your knowledge
http://www.academicjournals.org

Table 8: Summary of ANCOVA Analysis on the Difference in the Mean Score of Maximum Oxygen Uptake of the Experimental and Control Groups.

Source of variation	Type II sum of square	Df	Mean square	F	P	Partial Eta Squared
Corrected Model	4881.104	2	1809.237	672.884.	.000	.959
Intercept	119.261	1	36.267	13.488	.001	.191
PRERHR	334.483	1	3489.406	1297.767	.000	.958
GRP	4874.564	1	377.135	140.263	.000	.711
Error	966.80457	2	.689			
Total	35298.55060	60				
Corrected Total	5847.908	59				

R-squared = .835 (Adjusted R squared = 0.829)

Table 8 reveals that there is a significant difference between the mean maximum oxygen uptake of the experimental and control groups F (1, 57) = 287.390, $P<0.05$, $\eta_P^2 = .958$. Therefore, the null hypothesis was rejected. This shows that circuit training exercise programme had an effect on the maximum oxygen uptake of female secondary school teachers who were trained.

Discussion

The result of the study showed to an extent the difference between the effect of eight weeks of circuit training exercise programme of the experimental and control groups on the resting heart. The experimental group recorded a lower mean resting heart rate of ($\bar{x}$ = 81.30) than the control group ($\bar{x}$ = 86.83). Hence, there is a difference between the resting heart rate of the experimental and control group after the training , hence the exercise training had an effect on the experimental group, showing that hearth rate of the experimental group dropped after training which is good for a physically active person .Analysis of covariance (ANCOVA) carried out showed that there is a significant difference between the experimental and control groups mean scores of resting heart rate of female secondary school teachers. The finding of the study was in consonance with those documented by Miller, Pearcey, Cahill, McCarthy (2014) who observed that there was satisfactory

improvement in resting heart rate, HR among women who completed a four weeks circuit training exercise. Similarly, in a study by Ballantyne (2015) which aimed at describing how 12 weeks training exercises affects heart rate, the group that participated in circuit training exercises performed better this shows that the exercise had an effect on heart rate HR. The findings of the present research is in line with that of Frick (2013) which in his study revealed that there is a difference when trained person showed that their heart rate becomes lower at rest.

With respect to resting systolic and diastolic blood pressure, the statistical analysis showed there was a significant difference between the mean score of both resting systolic and diastolic blood pressure of the experimental and control groups after eight weeks of training. This recent study is related with the findings of Matthew (2011) who documented in his study Variation in blood pressure, during an isotonic and isometric exercise that there is a difference and improvement in terms of decrease in the systolic and diastolic blood pressure of the trained subjects than the control groups. Also, the result of the findings is also in accordance with Montoye, Guber, Cunningham & Dinka (2012) in the Tecumseh study found both systolic and diastolic blood pressure levels to be lower in most active people which shows there is a difference between an active and sedentary individual's heart rate.

The result of the study showed that there was higher mean maximum oxygen uptake of the experimental group while the control group showed lower mean maximum uptake. However the ANCOVA carried out showed that there was a significant difference between the mean maximum oxygen uptake of the experimental and control groups after eight weeks of circuit training exercise programme. This study is in agreement with that documented by Klika and Jordan (2013) which indicates that high intensity circuit training improves VO_2 max. AlsoBeneth and Dudley (2013) in a study asserted that using an exercise intensity of 85 – 90% of VO_2 max founded an increase of 32% in VO_2 max in both relative and absolute terms following a seven week endurance programme in their subjects. In contrary view, conversely, Orlander (2010) founded only 11% increase in aerobic power following 12m weeks of training using an exercise of low intensity (40 – 50 VO_2 max). The result of the study is supported by the findings of Hermansen (2012) who reported differences in Max$VO_2$of trained and untrained.

Conclusions

Based on the findings of the study, the following conclusions were made:

Female secondary school teachers who were trained with (CTEP) recorded a lower mean difference resting heart rate, resting systolic and diastolic pressure than those not trained with the programme the result strongly suggested that exercise, and being physically active lowers resting heart rate, resting systolic and diastolic pressure. On the other hand, Maximum oxygen uptake of the female secondary schools teachers who were trained showed a higher mean difference than the untrained also (CTEP) had an effect on them. Statistically, there were significant differences between the mean score resting heart rate, resting systolic and diastolic blood pressure, maximum oxygen uptake, of the experimental and control groups after eight weeks of (CTEP). . The results of this present study may be due to the regular exercise programme given to the experimental group even through the control group was given simple exercises to be doing on their own but they were not monitored as the experimental group. Also, the experimental group was eager to perform the exercise because the researcher makes the whole programme to be interesting though it was tiresome for them at the earlier stage.

Recommendation

Based on the findings of this study the researcher recommends that exercise programmes should be introduced in our schools and be seriously upheld by every teacher in the state and from time to time, exercise programmes of this kind should be sponsored by governments and non-governmental organizations (NGOs) to meet up with the standard of teachers required in this era.

References

American College of Sports Medicine (2015): Position stand on physical activity, physical fitness, and hypertension, Med Sci Sports Exerc 10: i-x,

American Heart Association (2014). w.w.w.heart.org /HEAR TO RG/conditions/m.ND.

Ballantyne C. (2015). *Circuit Training for your heart.* Early to rise www.earlytorise.com

Behnken, M. (2014).*Why the five components of physical fitness are important* www.healthtopics.org

Benneth, J.B; & Dudley, G.A (2013).*Exercise training induced alterations of cardiac morphology*. J. Appl. Physical. 61C3): 926-931.

Correteili, P. (2012). *Effect of specific muscle training on oxygen uptake on response and early blood locate J.APPL*. physioRespneuron.EX. Physio. 47c4):761.

Frick, M. (2013).*Effects of physical training on people.International journal of Epidemiology* 40(1) 45-59.

Hermansen, O. O. (2012). *Effect of physical training on oxygen transport system in man.*

Klika, B, & Jordan, C (2013).*High Intensity circuit training using body weight*. Maximum results with minimal investment ACSMS Health & fitness Journal Vol 17 – issue 3; P 8-13.

Kodama, .S. (2016).*Cardiorespiratory fitness as a quantitative predictor of all-cause mortality and cardiovascular events in healthy men and women.* A meta – analysis. Journal of the American medical Association 301 (19) 2024 -2035.

Lombardo, E. (2017). *A happy you: Your ultimate presentation for happiness.*A clinical psychologist.

Marc, S.A (2017).*Practical fitness advice for everyone.* Orb mortal wklykep 42. 66-672.

Matt, C. A. (2016). *Practical fitness advice for everyone*.Morbmortalwkly Rep 42.66-69.

Mathew, P. I. (2011*). Frequency and duration of interval training programs and changes in aerobic power* .J. Appl. Physiol. 38(3) 481-484.

Michelle, W. (2016).In<u>Exercise-Cognition Interaction</u>, exercise and cardiovascular health: A new paradigm on the horizon? Archives of neurology 62(3):79-82.

Miller, B.M.; Pearce, G.E.; Cahill F. & Mac Carthy H. (2014).*Effect of a short-term high-Intensity circuit Training Program on work Capacity and Heart Rate.*

Miller .K. (2011).*Communications theories: Perspectives, processes, and contexts* New York: McGraw – Hill.

Montoye, H. J; Guber, S; cunning ham, D. A, &Dinka, .S. (2012).*Age and Physiological adjustment to continous graded treadmill exercise.* Res. Quant 43: 175-186

More .J. (2013).*Physiology of exercise* 6th edition. St Loius the e. v. Mosby
Company.

Ogu, O.C., Agbanusi, E.C. &UmesiegbuG.p (2007). Survey of leisure Time Physical Activity of Nnamdi Azikiwe University Students. Journal of ICHPER S.D. African Region 2(2):21-27.

Ujuagu, N. A (2017). Effects of circuit training exercise program on selected physical fitness components of female secondary school teachers. A P.hd Dissertation, Nnamdi Azikiwe University Awka.

Vercci, F. M (2012). *Measurement concept in physical education*. St. louis: The C. V. Mosby

Walther, C. (2016). The effect of exercise training on endothelial function in cardiovascular diseases in humans. Exercise and sports Reviews 32: 129-134.

Willker, B. (2018). *Circuit Training and circuit training Routines.* http:// the stretching handbook. Com/newsletter.ND.

UNIJERPS