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Effect Of Short Term Aerobic Exercise (Football Training) On Lipid Profile And Myoglobin Levels In Apparently Healthy Students Of College Of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

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Abstract

This study investigated the effect of short term aerobic exercise on lipid profile and myoglobin levels in apparently healthy students of College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria. A total of 60 apparently healthy young students aged between 18-40 years were randomly selected for the study. They were rested for a period of two weeks after which they were subjected to football exercise for 30 minutes (3 times) in a week for a period of 3 weeks. The demographic and anthropometric data of subjects were obtained using a well-structured questionnaire. Their blood pressures reading were obtained also. Thereafter, 5mls of baseline (day 0) and post-exercise (day 21) blood samples were collected from each subject before the commencement and at the end of the exercise on the last day of the training into a plain container for estimation of biochemical parameters (TG, TC, LDL, HDL, Myoglobin levels) respectively using standard methods. Data obtained were statistically analysed by unpaired student t-test and Pearson r correlation. The result showed that the mean serum levels of TG (1.41±0.60 vs 1.04±0.43) TC (5.22±0.98 vs 4.41± 0.90), LDL (3.92±0.99 vs 3.36±0.92) as well as myoglobin (16.04± 4.64 vs 13.38±5.21) and DBP (75.16±10.54 vs 68.59±8.57) were significantly decreased, whereas, there was a significant increase in the mean serum level of HDL (0.83± 0.30 vs 0.95±0.28) and SBP (114.69±9.21 vs 131.48±12.84) in subjects after exercise when compared to before exercise ($p<0.05$). However, the mean BMI of the subjects remained the same before and after exercise ($p>0.05$). Therefore, short term moderate intensity aerobic exercise could be of importance in prevention and management of cardiovascular disease.

Key Words: Short Term Aerobic Exercise, Football Training, Lipid Profile, Myoglobin, Apparently Healthy Students, Nnewi Campus.

Introduction

The word exercise is derived from the latin word "EXERCITIUM" which means to train. Exercise is a process in which energy stored as chemical compound is transformed into mechanical and heat energy (Nevell *et al*., 1989). Exercises are generally grouped into three types depending on the overall effect they have on the human body:

1. Aerobic exercises; such as cycling, walking, running, hiking and playing tennis, football, volleyball, jogging, etc; focus on increasing cardiovascular endurance (Wilmore and Knuttgen, 2003).
2. Anerobic exercises; such as weight training, increase short term muscle strength (De vos *et al*., 2005).
3. Flexibility exercises; such as stretching, improve the range of motion of muscles and joints (O' Connor *et al*., 2006).

Aerobic exercise is physical exercise of relatively low intensity that primarily depending on the aerobic energy-generating process (Plowman and Smith, 2007). Aerobic denotes "with oxygen" referring to the use of oxygen in order to adequately meet energy demands during exercise through aerobic metabolism (McArdle *et al*., 2006). Physical exercise has become increasingly popular as a method of health enhancement. Epidemiologic and laboratory studies have shown that increased levels of physical activity are associated with longevity and reduced risk for cardiovascular disease (Benedict *et al.*, 1996; Blair and Morris, 2009; Charkoudian *et al*., 2006).Lack of activity, on the other hand, has been shown to be associated with decreased exercise capacity, cardiovascular deconditioning, and muscule atrophy (Davy *et al*., 1996; DeSouza *et al*., 2000).Regular physical activity is an essential component of a healthy lifestyle that helps to keep fitness of the body (Jourkesh *et al*., 2011). Probably because of heavy academic demands of medical college, most of medical students lead a physically inactive life. It may cause medical students exhausted or may have no time to exercise (Choudhary *et al*., 2015). The American College of Cardiology/American Heart Association recommends at least 30 minutes of moderate (at 50–70% of maximal predicted heart rate) exercise on most days to reduce the risk of cardiovascular events (NCEP, 2002). Several human studies clearly demonstrate that chronic aerobic exercise regimens improve cardiovascular function. This is true not only in healthy subjects without any underlying risk factors (Clarkson *et al*., 1999), but also in older people (Benjamin *et al*., 2004), and those with cardiovascular risk factors (Hambrecht *et al*., 1998). Indeed, those with cardiovascular risk factor/disease will benefit more. There is a much higher consistency in the results of studies which assess participants with cardiovascular disease/risk factors compared to healthy subjects. Patients with hypertension (Higashi *et al.*, 1999), type 2 diabetes (O'Keefe *et al.*, 2010), metabolic syndrome (Blair, 2009), stable cardiovascular disease (Penedo and Dahn, 2005), myocardial infarction (Durstinea *et al*., 2013), all benefit from exercise training compared to those who do not participate in any training. Importantly, an exercise regimen that improves endothelial function in diabetic patients fails to benefit healthy subjects (Maiorana *et al*., 2001). In healthy individuals, a longer and more intense exercise protocol is needed to induce measureable changes in cardiovascular parameters, while older and sicker subjects can benefit from less intense exercise regimens. Treatment and control of established known cardiovascular risk factors includes the reduction of hypercholesterolemia, hypertension, and smoking (Lavrenčič *et al*., 2000). Physical activity, as one the most important components of cardiovascular disease prevention, has crucial roles at all levels. Despite the strong evidence linking physical activity to cardiovascular disease risk reduction, there remains much uncertainty regarding the underlying mechanisms. Scientific and technological advances have almost completely eliminated the necessity for physical exertion in daily life that has been especially true in the past few generations (O'Keefe *et al*., 2010). On the other hand athletes lead a physically active life as their academic curriculum itself includes daily physical exercise and outdoor games (Choudhary *et al*., 2015). It has been documented physical inactivity as a major health problem(Blair, 2009) and regular exercise is important for health and well being(Wilt *et al.,* 2004; Hollmann *et al*., 2007; Sattelmair *et al*., 2009). Physical inactivity is contributing factor in several chronic diseases and conditions (Vona *et al.,* 2004; Hambrecht *et al.*, 2000). Physiology of Exercise offers the student an opportunity to observe the effect of training and helps to evaluate the Cardiovascular system. This has created a great enthusiasm in our mind to undergo this study. Therefore, this study is designed to assess the effects of exercise (football practice) on the lipid and myoglobin level of healthy subjects of College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria. Findings from this study may hopefully provide further evidence that will guide the use of physical exercise to improve the health of both apparently healthy as well as sick individuals in our community and the world at large.

Materials And Methods

Study Area

The study was carried out in College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

Experimental Design

A total of sixty (60) students (secondary/amateur football players) who volunteered to participate in the study, were recruited for this study. The subjects were instructed not to participate in any form of sports for one-week. After the one week of rest, the subjects were randomly selected. Each team was then subjected to football training for a minimum time of (30mins) for three consecutive days in one-week.

A pre-exercise blood pressure(BP) was measured by taking two BP readings on the right arm placed at the heart level, using an automatic blood pressure measuring device OMRON 907 (OMRON, Hoofdorrp, Netherlands) after the subjects had rested for at least 5minutes in a sitting position upon arrival to the football court. The measurements were taken 60 seconds apart and the average pre and post blood pressures were recorded and used for our analyses.After the blood pressures were taken, 5mls of pre-exercise(baseline) blood sample was drawn from the ante-cubital vein of each of the participating subject before the commencement of the exercise (day zero). Post-exercise blood sample and blood pressure were also taken after exercise on the last day (day 21). Anthropometric parameters such as the height and weight of each subject were measured using a standard standiometer and a weighing scale before the exercising session and their body mass index (BMI) were calculated from it. Subjects' dietary pattern and lifestyle were also obtained using a well-structured questionnaire. Thereafter, the biochemical parameters (LDL, HDL, TG, TC, and Myoglobin levels) were subjected to laboratory analysis. LDL level was determined using enzymatic method as described by Assman *et al*. (1984); HDL level was determined using enzymatic method as described by Burstein *et al.* (1980). The enzymatic method as described by Tietz (1990) was adopted in the estimation of serum triglycerides, whereas, total cholesterol level was determined using the enzymatic method as described by Roeschlau *et al.* (1974). Myoglobin level was assayed using the method as described by Saranchak and Bernstein, (1974). The blood pressure readings were determined using the method described by Chobanian *et al.,* (2003).

Ethical Consideration

Ethical approval was sought and obtained from the Ethics Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria in accordance with the declaration of Helsinki on research involving human subjects (Snezana, 2001; Levine and Robert, 2006). **Inclusion and Exclusion Criteria**

Apparently healthy students' age between (18 – 40) years, which were willing to participate in the study were included for the study whereas, the subjects younger or older than 40 years old; those suffering from cardiovascular diseases or who sustained any form of musculo-skeletal injury, alcoholics and smokers were excluded from the study.

Statistical Analysis

Statistical package for social science (SPSS) version 20 was employed in the analysis of the result and the data obtained for cardiovascular function parameters were expressed as mean± standard deviation and parameters were compared using unpaired student t-test and Pearson r correlation. Level of significance was set at $P<0.05$.

Results

The mean values of their age, weight, height and BMI were (23.69±3.29yrs, 63.14±9.89Kg, 1.68±0.78m, 22.41±2.22Kg/m^2) respectively for both pre and post exercise. Their mean diastolic blood pressure was significantly reduced after exercise ($P<0.05$). However, the mean pre and post exercise systolic blood pressure showed significant increase after exercise (Pre-114.69±9.21mmHg; Post-131.48±12.84mmHg; $P<0.05$), See table 1.

Table 1: Anthropometric measures of participants (Mean±SD, N=60).

Group	Age	Weight	Height	BMI	SBP	DBP
Pre- exercise n= 60	23.69±3.29	63.14±6.89	1.68±0.78	22.41±2.22	114.69±9.21	75.16±10.54
Post exercise n=60	23.69±3.29	63.14±6.89	1.68±0.78	22.41±2.22	131.48±12.84	68.59±8.57
t-value	0.000	0.000	0.000	0.000	1.826	4.999
p-value	>0.05	>0.05	>0.05	>0.05	<0.05	<0.05

***Statistically significant at p<0.05.**

There were significant decrease in the mean values of triglycerides, total cholesterol, low density lipoprotein and myoglobin levels in the subjects post-exercise compared with pre-exercise levels (p<0.05).There was however, a significant increase in the mean values of the participant HDL level after exercise (P<0.05), see table 2.

Table 2: The mean serum values of lipid profile and myoglobin levels of the subjects before and after exercise.

Group	TG	TC	HDL	LDL	MYOGLOBIN
Pre- exercise n= 60	1.41±0.60	5.22±0.98	0.83±0.30	3.92±0.99	16.04±4.64
Post- exercise n=60	1.04±0.43	4.41±0.90	0.95±0.28	3.36±0.92	13.38±5.21
t- value	8.525	1.212	0.925	0.381	1.359
p- value	0.000	0.000	0.019	0.001	0.003

***Statistically significant at p<0.05.**

Interestingly, there was no significant correlations observed in the parameters studied in the subjects before and after exercise (p>0.05), see table 3 and 4 respectively.

Table 3: Levels of association between parameters studied in pre-exercise subjects

Parameter	Pearson's correlation coefficient	f-values	p-value
TG vs HDL	-0.021	0.815	>0.05
TG vs BMI	-0.048	0.587	>0.05
TG vs Age	0.037	0.675	>0.05
TC vs weight	0.009	0.920	>0.05
HDL vs Myoglobin	0.034	0.704	>0.05
HDL vs BMI	-0.025	0.779	>0.05
HDL vs SBP	-0.037	0.679	>0.05
HDL vs Age	0.035	0.694	>0.05
LDL vs weight	0.021	0.818	>0.05
Myoglobin vs weight	0.002	0.986	>0.05
Myoglobin v DBP	-0.027	0.762	>0.05
Height v SBP	0.000	0.999	>0.05

***Statistically significant at p<0.05.**

Table 4: Levels of association between parameters studied in post-exercise subjects

Parameters	Pearson's correlation coefficient	f-values	p-value
TG vs TC	0.029	0.818	>0.05
Weight vs HDL	-0.013	0.981	>0.05
Weight vs SBP	0.010	0.940	>0.05
TC vs weight	0.003	0.981	>0.05
HDL vs Weight	-0.013	0.918	>0.05
HDL vs Age	-0.037	0.770	>0.05
BMI vs SBP	0.037	0.773	>0.05
Weight vs TC	0.003	0.980	>0.05
Weight vs DBP	-0.035	0.784	>0.05
Myoglobin vs weight	-0.025	0.841	>0.05
Myoglobin vs DBP	-0.003	0.980	>0.05
Height vs SBP	0.037	0.769	>0.05

***Statistically significant at p<0.05.**

Discussion

Several reports have shown that duration and/ or intensity of exercise elicit different effects on minerals metabolism and that inadequate status of the body mineral composition can lead to a diminution of performance and endurance both in sportsmen and rats (McDonald and Keen, 1988; Rassiguier *et al.*, 1990; Clarkson, 1991). Other report showed clearly during aerobic exercise, systolic BP increases as the exercise intensity increases the heart works harder to pump more oxygenated blood to the muscles (Meludu *et al.*, 2002). At the same time, diastolic BP remains relatively stable and may even decrease slightly. On average, men have higher BP than women during aerobic exercise (Brooks *et al.*, 2005).

From this study, it was observed that the mean values of the subjects' age, weight, height and BMI were (23.69±3.29yrs, 63.14±9.89Kg, 1.68±0.78m, 22.41±2.22Kg/m^2) respectively for both pre and post exercise. It was also observed that diastolic blood pressure was significantly reduced after exercise (Pre-75.16±10.54mmHg; Post-68.59±8.57mmHg)($P<0.05$) but there was an increase change in systolic blood pressure after exercise (Pre-114.69±9.21mmHg; Post-131.48±12.84mmHg).The findings from this work revealed that during short-term football exercise, diastolic pressure decreased significantly. This decrease in the diastolic pressure can be attributed primarily to the vasodilation of the arteries from the exercise bout which causes a reduction in peripheral resistance. It could also be due to a decrease in the blood volume caused by dehydration which causes water loss after exercise. This finding is in consonance with the findings of Kelly, (2000) who conducted a meta-analysis on resistance exercise and reported a decrease in diastolic blood pressure. However, there was also a significant increase in their systolic blood pressure. A negative correlation between the systolic and diastolic blood pressure after the exercise was observed, whereas the pre-exercise blood pressure showed a positive correlation, showing that the change was exercise induced. There was a significant decrease in the mean values of triglycerides, total cholesterol, low density lipoprotein and myoglobin ($p<0.05$), this decrease in the values of triglyceride may be attributed to low fat diet, malnutrition in the body during exercise, also the reduction in the total cholesterol can be explained by the fact that during exercise, increase in high density lipoprotein is accompanied by reduction in low density lipoprotein as they are the constituents making up the heart function. These findings are in agreement with that of Baydil, (2013), who reported that the change in the mean concentration of triglyceride and total cholesterol in individuals who exercised to the point of exhaustion were significant. There was also a significant decrease in the mean values of the participant myoglobin level to after exercise ($P<0.05$). This confirms the work of Ugwuja *et al.*, 2014; who showed that exercise reduced total cholesterol and myoglobin concentration significantly. This can be attributed to the moderate intensity and short duration of the exercise (Ugwuja *et al.*, 2014). It was also observed in this study that the pre-myoglobin concentration correlated positively with weight and HDL ($p<0.005$), whereas no correlation was found between these parameters in the post-exercise blood sample. This is in accordance with previous studies (Traynor *et al.*, 2006; Lamb *et al.*, 2005).

Conclusion

Based on our findings, there were significant decrease in the mean serum levels of total cholesterol, triglyceride, low density lipoprotein and myoglobin whereas, the mean serum high density lipoprotein was significantly increased in the subjects after exercise. These findings therefore, suggest that regular physical exercise has a possible positive effect on the improvement of lipid metabolism leading to a healthier cardiovascular function.

Recommendation

Based on our findings, we recommend that short term football exercise (aerobic exercise) could be used at least as an adjunct in the therapy and management of cardiovascular disease. Therefore, health education strategies should be adopted to enlighten the general public on the beneficial effects of short term aerobic exercise (football exercise).

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