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RESPONSE TO TWO-MODE OF EXERCISE TRAINING (BRISK WALKING AND JOGGING) OF UNIVERSITY STAFF HIGH-DENSITY LIPOPROTEIN

Edward Odogbu ODO[1]
Charlse Okey OGU[2]

[1]Physical and Health Education Unit, School of General Studies, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.
Email: odo.edward@mouau.edu.ng, GSM:+23408038312273

[2]Department of Human Kinetics and Health Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria

Abstract

The purpose of this study was to establish the response to brisk walking and jogging of volunteered university staff high-density lipoprotein cholesterol. The area of this study was Michael Okpara University of Agriculture, Umudike, and Abia State, Nigeria. The age of the regular non teaching staff is 35–60 years. As a result of the call for free lipid profile test, the population of this study was 67 volunteered university staff who presented themselves for the free lipid profile test at the University Health Center. Fifty-four (54) Non-teaching staff (39 females and 15Males) who pass the inclusion criteria test were selected as subjects, while 13 (9 male and 4 female) lost out of been selected as subjects of this study after strict consideration of both inclusion and exclusion criteria. Data were collected using two instruments- Lipid and Risk Identification Questionnaire (LRIQ) and Venous blood samples from the subjects for lipid profile tests. The hypotheses were tested using ANOVA. Findings showed that after the treatment the male subjects in Brisk walking group had significant mean gain in the high-density lipoprotein cholesterol than jogging group. The HDL cholesterol of the female has almost equal positive response to both brisk walking and jogging exercise. The university programme and calendar that will motivate and give her staff opportunities towards active participation in exercise should be developed.

Keywords: Brisk walking, jogging, lipid profile, high-density lipoprotein

Introduction

Physical inactivity and Lipid profile abnormalities are among the risk factors affecting a growing number of adults across the globe. Lifestyle factors, including diet and exercise are well recognized as important modifiable determinants of lipid profile, and risk for cardiovascular disease (CVD). Lipid otherwise called cholesterol plays a major role in human heart health and high cholesterol is a leading risk factor for human CVD such as coronary heart disease and stroke. Cholesterol can be good (high-density lipoprotein) or bad (low-density lipoprotein) to the cardiovascular system (Ma & Shieh, 2006).

The modern lifestyle of more frequent intake of energy-dense food and culture of low levels of physical exercises and linked to increasing risk of lipid profile disorders. Exercise still remains the optimal strategy to improve the majority of lifestyle-induced metabolic disorders (Parr, Heilbronn, & Hawley, 2019). The beneficial effect of exercise on the cardiovascular system is well documented. There is a direct correlation between physical inactivity and cardiovascular mortality, and physical inactivity is an independent risk factor for the development of lipid disorders including coronary artery disease. Low levels of physical exercise increase the lipid profile abnormalities and risk of CVD mortality (American Heart Association., 2017). The decision to initiate cholesterol-lowering therapy and high HDL-c therapy depends on the individual's risk of experiencing a cardiovascular (Juneau, 2019) since according to Abdulhadi (2019), high HDL levels protect against coronary heart disease.

In lipid profile test, High Density Lipoprotein cholesterol (HDL-c) less than 40 mg/dl is considered to be low, and a major risk factor for heart disease (Ma & Shieh, 2006). Meanwhile higher HDL-c level is has been reported to be better for an improved healthy heart (Abdulhadi 2019). Walking and jogging combine two elements, which have been reported to be beneficial for well-being, HDL-c level, and health. Among healthy populations even short exposure to natural environments (through physical exercise such as walking and jogging) can reduce mental fatigue and stress and improve well-being (Barton & Pretty 2010**;** Berman, Jonides & Kaplan 2008**;** Bratman**,** Daily**,** Levy, & Gross, 2015**).** Walking and jogging requires no special skills or facilities and is achievable by almost all groups of people.

There is preliminary evidence that exercise improves the antioxidative and anti-inflammatory properties of HDL (Ruiz-Ramie, Barber, & Sarzynski 2019). Most times poor HDL-c level is the result of ineffective lipid therapy. Individuals under the lipid lowering drug therapy complain of adverse effects of drug therapy. This has equally resulted to non and poor adherence to drug prescriptions. Exercise therapy could be a positive adjunctive alternative to these health problems associated to the lipid lowering drug, cardiac and lipid profile abnormalities. The participants in exercise therapy can use it whenever they choose without adverse effect, unlike lipid-drug therapy.

Method

Participants

The researchers through the Medical and Health Department of Michael Okpara University of Agriculture, Umudike Abia State, Nigeria called advertised for staff free lipid profile tests. The advert was placed on the Notice board of different colleges and staff school of the University. Volunteered Non-academic staff with elevated lipid profile aged 35-60 years from Michael Okpara University of Agriculture, Umudike Abia State, Nigeria presented themselves for the study. The population of the study was 67. Questionnaire that contained both Inclusion and exclusion criteria were given to the volunteered staff and their response collated. Hereafter, 54 Non-academic staff was qualified and sampled for the study. The 54 subjects for the study was randomly sampled into unequal three groups- Brisk walking group 18(13 females and 5 males), Jogging group 13(8 females and 5 males) and Control group 23 (18 females and 5 males).

Instruments

The instruments for data collection in this study were venous blood samples from the subjects. The data were collected by collecting venous blood samples from the subjects. About 5ml of venous blood samples were collected from the subject into plain tubes and allowed to clot retract and separated and the serum collected for the determination of lipid profile of the subjects.

Lipid and Risk Identification Questionnaire (LRIQ) was also administered to the subjects to elicit information on demographic data. The items on demographic data are: age range, employer, nature of employment (teaching or non teaching staff), and gender. The items for inclusion and exclusion criteria are: age, wether the subject is on sedentary (exercise less than 2 times/wk), not under any lipid-lowering drug therapy.

Procedures

Pretest and posttest Lipid profile test (screening) was taken by two certified Chemical pathologist and Medical laboratory scientists, during pre-test and post-test. Each of the subject was screened by the same examiners to minimize measurement error. Under all strict aseptic precautions, blood sample were collected from each subject after overnight fasting of about 12 hours. The serum were separated immediately after obtaining the blood sample by using centrifugation for 10 minutes. Blood lipid concentration and Lipid Profile- HDL cholesterol were measured and calculated using Blood Analyzer. The appropriate chemical testing kits were used.

The inervention group are: Group 1) Brisk walking and Group 2) Jogging group. The intervention group- Brisk walking group and Jogging group trained with one Research assistant each. In the exercise prescription for the intervention groups, all the subjects in both Brisk walking and Jogging group were guided to perform at the frequency of three time per week. The duration of each training session was 50 minutes- 5 munites warm up, 40 munites no break brisk walking exercise and jogging exercise and 5 munites cool down.

The mode of exercise- Brisk walking exercise and Jogging exercise were aerobic exercises. The Brisk Walking Exercise comprises –self paced walk or move on the feet with slow pace. The Jogging exercise comprises- self- paced jog and trot. The training programme for the two intervention groups lasted for 12 weeks (3 months). There were three sessions per week (Mondays, Wednesdays, and Fridays). Every training session were made to be in the evening time, 5pm to 6pm, and were made up of three segments; the general warm-up, conditioning bout and cooldown.

The brisk walking execise and jogging exercise programme took place at the Michael Okpara University of Agriculture (MOUAU), Demonstration

Secondary School Football field. The subjects in the control group were instructed to live their normal lifestyle.

Changes in HDL-cholesterol were compared between the 3 groups- Brisk walking group, Jogging group and control group. Test for Mean Differences in the HDL-cholesterol level in the three groups across gender were carried out. The hypotheses were tested using ANOVA.

Results

Table 1: Test for Mean Differences in the HDL-cholesterol level of Male non-academic staff in the three groups.

		Sum of Squares	Df	Mean Square	F	Sig.
PostHDL-c	Between Groups	728.133	2	364.067	10.482	.002
	Within Groups	416.800	12	34.733		
	Total	1144.933	14			

Table 1 indicated that ANOVA revealed a significant main effect on the PostHDL-cholesterol of the male university staff in the three groups $F(2,14) = 10.482$, $p<.05$. Hence, the hypothesis that there is no significant difference in the Post HDL-cholesterol of male university staff was rejected. Post hoc analysis showed that differences occurred in male staff' HDL-cholesterol only in walking and control groups.

Table 2: Test of Multiple Comparisons in the Mean Differences of Male HDL-cholesterol Among the three Groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
walking exercise	jogging exercise	7.20000	3.72738	.232	-3.1601	17.5601
	Control	17.00000*	3.72738	.002	6.6399	27.3601
jogging exercise	walking exercise	-7.20000	3.72738	.232	-17.5601	3.1601
	Control	9.80000	3.72738	.066	-.5601	20.1601
Control	walking exercise	-17.00000*	3.72738	.002	-27.3601	-6.6399
	jogging exercise	-9.80000	3.72738	.066	-20.1601	.5601

*. The mean difference is significant at the 0.05 level.

Table 3: ***Test for Mean Differences in the HDL-cholesterol level of Female non-academic staff in the three groups.***

		Sum of Squares	Df	Mean Square	F	Sig.
PostHDLCHOL	Between Groups	2102.638	2	1051.319	42.015	.000
	Within Groups	900.798	36	25.022		
	Total	3003.436	38			

Table 3 indicated that ANOVA revealed a significant main effect on the PostHDL-cholesterol of the female university staff in the three groups $F(2,38) = 7.771$, $p<.05$. Hence, the hypothesis that there is no significant difference in the PostHDL-cholesterol of female non-academic staff was rejected. Further analysis using Bonferroni post hoc test indicated that differences in the female non-academic staff' HDL-cholesterol differed in walking and control groups; and jogging and control groups but not in walking and jogging groups.

Table 4: Bonferroni Test of Multiple Comparisons in the Mean Differences of Female HDL-cholesterol among the three Groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
walking exercise	jogging exercise	4.45192	2.24779	.166	-1.1924	10.0962
	Control	16.07692*	1.82069	.000	11.5051	20.6487
jogging exercise	walking exercise	-4.45192	2.24779	.166	-10.0962	1.1924
	Control	11.62500*	2.12553	.000	6.2877	16.9623
Control	walking exercise	-16.07692*	1.82069	.000	-20.6487	-11.5051
	jogging exercise	-11.62500*	2.12553	.000	-16.9623	-6.2877

*. The mean difference is significant at the 0.05 level.

Discussions

There was sufficient evidence to suggest a favourable association of brisk walking and jogging on HDL-C across male and female in the two intervention groups. The ANOVA revealed a significant main effect on the PostHDL-cholesterol of the male non-academic staff in the three groups. The hypothesis that there is no significant difference in the Post HDL-cholesterol of male non-academic staff was rejected. Post hoc analysis showed that differences occurred in male non-academic staff' HDL-cholesterol only in brisk walking and control groups. Considering groups, male non-academic staff in Brisk walking group and Jogging group had the significant mean gain in HDL-cholesterol, though brisk walking group had higher mean gain. Male in control group do not have significant mean gain in HDL-cholesterol.

The hypothesis that there is no significant difference in the PostHDL-cholesterol of female non-academic staff was rejected. Further analysis using Bonferroni post hoc test indicated that differences in the female staff' HDL-cholesterol differed in walking and control groups; and jogging and control groups but not in walking and jogging groups. The HDL cholesterol of the female subjects had almost equal response to brisk walking and jogging exercise.

Both male and female in Brisk walking group and jogging group had significant improvement (mean gain) in their HDL-cholesterol level unlike male and female non-academic staff in the control groups. This could have also resulted from the fact that exercise treatment given to the Brisk walking group and jogging group could help improve their HDL-cholesterol level. Also, the exercise dose-50 minutes each training session proved to be a significant dose that led to the improved HDL-cholesterol. The results of this study showed that HDL-cholesterol levels differed significantly between the control group and the intervention groups (Brisk walking group and Jogging group).

Studies have also supported the finding that regular exercise improves HDL–cholesterol by increasing the profile level. Participation in moderate and vigorous aerobic exercise had a positive affect on high-density lipoprotein cholesterol (Ikekpeazu, Oranwa, Ogbu, Onyekwelu, Esom, & Ugonabo**,** 2017; Kwon & Lee, 2017; Loprinzi & Addoh, 2016; Mawi, 2009). Regular walking exercises prove to induce HDL-cholesterol toward healthy level as against irregular exercise.

Similarly, Bemelmans, Blommaert, Wassink, Coll, Spiering, Graaf, and Visseren, (2012) reported the relationship between walking speed and changes in cardiovascular risk factors in participants of a 12-day walking tour to Santiago de Compostela. It was a prospective cohort study. It is a single-centre study with healthy middle-aged volunteers. The Participants are healthy middle-aged men (n=15) and women (n=14). Subjects using lipid-lowering medication were excluded. Participants walked 281±10 km of the classical route to Santiago de Compostela in 12 days in 2009. Walking speed was recorded and blood pressure, weight, waist circumference, lipids and glucose were measured every other day. Changes in risk factors were compared between gender-pooled groups with faster and slower walking speed. Second, the relationship between walking speed and changes in risk factors was quantified using a linear mixed effects model. On the results, in the faster walking speed (4.6±0.2 km/h) group, high-density lipoprotein cholesterol (HDL-c) increased more than in the slower walking speed (4.1±0.2 km/h) group (difference in change between groups: 0.20; 95% CI −0.02 to 0.42 mmol/l). A 1 km/h higher walking speed was related to an increase in HDL-c (0.24; 95% CI 0.12 to 0.30 mmol/l). In conclusions, walking the same distance faster improves HDL-c more in healthy middle-aged subjects.

However, similar studies (Murtagh, Boreham, Nevill, Hare, and Murphy, 2005; Omar, Husain, Jamil, Nor, Ambak, Fazliana, Zamri. & Aris, 2018; Slentz, Aiken, Houmard, Bales, Johnson, Tanner, Duscha, and Kraus

2005) have come with contrary findings which could be linked with insufficient exercise dosage and decreased amount of exercise over time.

Murtagh, Boreham, Nevill, Hare, and Murphy, (2005) examined the effect of instructing sedentary individuals to undertake 20 min of brisk walking, in two different patterns, 3 days per week, on fitness and other cardiovascular disease (CVD) risk factors. Forty-eight subjects (31 women) mean (FSD) age 45.7 F 9.4 year were randomly assigned to either one 20-min walk (single bout), two 10-min walks (accumulated bouts) 3 days week[1] for 12-week, or no training (control). Blood pressure and fasting lipoproteins were assessed. Thirty-two subjects completed the study. Participants were instructed to walk briskly throughout the 12-week walking programme and were permitted to use the treadmills at the university free of charge. Subjects were advised to perform all walking bouts on treadmills. Walkers recorded the duration, speed, distance and RPE of all walks in a training diary. Subjects were instructed maintain their usual dietary habits throughout the study. There were also no changes in body mass, adiposity, blood pressure, waist and hip circumferences, or lipid/lipoproteins. In the conclusion, brisk walking for 20 min on 3 days of the week fails to alter cardiovascular disease risk factors in previously sedentary adults.

Imamoglu, Atan, Kishali, and Burmaoglu (2005) compared plasma triglyceride and lipoprotein concentrations of male and female subjects of different training levels. In this study participated 20 male wrestlers, 44 male and 51 female physical education students and 40 sedentary females. The results showed no significant differences in lipid profile between control subjects and wrestlers with a 10-year experience. Wrestling training, consisting predominantly of anaerobic and strength exertions, was insufficient to stimulate a rise in HDL-cholesterol level.

In Dundar, Kocahan, and Sahin, (2019) study of the effects of 8 weeks of basketball training on blood lipids among basketball players. The exercise groups were given 2 h of basketball training for 5 d a week and for 8 weeks. The control group was randomly selected among the adolescents who did not regularly exercise. The results suggest low levels of cholesterol, triglyceride, high-density lipoprotein (HDL), and low-density lipoprotein (LDL) parameters ($p < .05$). This study demonstrated that after 8 weeks of chronic exercise training, insulin levels decreased. The decrease in leptin and irisin levels is compatible with the pattern of decrease in the lipid levels as a result of chronic exercise.

Dietary factors (caloric consumption) influence the development of CVD either directly or through their action on traditional risk factors, such as plasma lipids, BP, or glucose levels (Mach, Baigent, Catapano, Koskinas, Casula, Badimon, Chapman, Backer, Delgado, Ference, 2020). Conway, Genest, Habi, & Leiter -Expert Opinion (2019) reports that one of the important focus should be to decrease caloric consumption and by increasing exercise (to more than 200 min per week) as needed to achieve and maintain a body mass index of less than 27 kg/m2 (ideally less than 25.

The significant differences in mean gain in HDL-cholesterol in favour of subjects that took part in both brisk walking and jogging exercises as against those in control group is an evidence that exercise is more effective than diet in improving blood HDL-cholesterol level. The differences exhibited after the training could have been as a result of differential body responses and adaptation to exercise (Odo, Emeahara & Agwubuike, 2017). High levels of HDL cholesterol can lower the risk of heart disease and stroke (CDC, 2020). Hart, & Buck, (2019) reported that certain dimensions of health-related quality of life (BMI, blood lipid) have been shown to improve in older adults due to exercise training intervention.

Fogoros (2019) reports that a 2.5 mg/dL rise in HDL may actually amount to a substantial reduction in cardiovascular risk. Gao, Xu, Zhang, Lu, Gao, and Feng, (2020) reports that a 4 week of living high-training low and high may help to relieve the loss of lean soft tissue mass and serum HDL-C of overweight and obese females. Pagonas, and Westhoff, (2019) states that if exercise would be a drug, it would be the ideal cardiovascular polypill. It reduces blood pressure, weight and low-density lipoprotein cholesterol and it improves glucose tolerance and endothelial function. Gordon, Chen, and Durstine, (2016) reports also reductions in body weight following aerobic training result in a significant improvement in HDL-C levels.

Conclusions

It can be concluded that brisk walking and jogging is an effective therapy for improving the blood HDL-cholesterol level. However, brisk walking is more effective in improving male HDL cholesterol than jogging. Brisk walking and jogging exercises can be recommended for persons with low HDL-cholesterol level without any adverse effects. The HDL cholesterol of the female has almost equal positive response to both brisk walking and jogging exercise. For reducing the risk of low HDL-cholesterol level and lipid, brisk walking exercise and/or jogging exercise with moderate intensity is more effective than depending only on diet and being inactive. To achieve improved HDL-cholesterol level higher dose of walking exercise and jogging exercise of about 50-60 minutes per day could lead to significant mean gain. Physical inactivity negatively affects the blood HDL-cholesterol level.

It was recommended that, the university programme and calendar that will motivate and give university staff opportunities towards active participation in sports and exercise should be developed and implemented. Authorities of tertiary institutions of higher learning, ministries and agencies should identify and implement physical exercise programme as health-enhancing strategies among her staff. Staff of the university should imbibe the culture of regular brisk walking exercise during their leisure period even outside school environment to improve their lipid profile. University staff regardless of age and gender should make it a lifestyle exercising at least 3 times per week. Individuals who experiences adverse effects with the lipid lowering drug should go for brisk walking or jogging exercises as an adjunct alternatives.

All the participants signed consent of participation form after attaining personal understanding of the rationale of the study. The study procedures were approved by the University.

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