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Effect of Low Intensity Aerobic Exercise on Anthropometric Parameters and Cardiometabolic Risk Markers in Sedentary Individuals

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Abstract

Background: Walking is a common form of low intensity exercise that is suitable for most sedentary population. Regulation of blood lipids is an important mechanism by which physical exercise reduces cardiovascular risk.

Aim: This study aimed to determine whether low intensity exercise modulates cardiometabolic risk markers in previously sedentary individuals.

Methods: Twenty sedentary adults (12 males and 8 females) participated in an eight weeks low intensity exercise. The exercise consisted of brisk walking for 45 minutes, 3 times per week for 8 weeks under supervision. Serum glucose, anthropometric parameters, blood pressure and lipid profile were determined at baseline and after four, six and eight weeks of the exercise programme.

Results: There was a non-significant decrease in body mass index (BMI) (baseline: 21.20±2.27; 8 weeks: 20.38±2.10 kg/m^2) and blood pressure (systolic – baseline: 113.00±8.01; 8 wks: 108.50±6.70: diastolic – baseline: 74.50±5.10; 8 wks: 71.50±3.66 mmHg).Serum glucose was significantly reduced after 8 weeks exercise (baseline: 5.12 ± 0.32; 4 wks: 4.85±0.28; 6 wks: 4.67±0.23; 8 wks: 4.47±0.23 mmol/L $p<0.05$). There was a significant decrease in total cholesterol after 6 and 8 wks (baseline: 4.94±0.40; 6 wks: 4.48±0.29; 8 wks: 4.43±0.28 mmol/L) while a significant decrease in LDL cholesterol after 4, 6 and 8 weeks was observed (baseline: 3.21±0.52; 4 wks: 2.51±0.38; 6 wks: 2.41±0.37; 8 wks: 2.34±0.36 mmol/L $p<0.05$).

Conclusion: The results indicate that low intensity exercise may be beneficial in regulating lipid profile and blood glucose concentrations in individuals.

Key words: Low intensity exercise, Anthropometric Cardiometabolic,

Keywords: antibiotics, pattern, sensitivity, resistance, sensitivity, urinary tract infections, uropathogen

Introduction

Physical exercise can be defined as any forms of bodily activity perform by an individual to maintain physical fitness and to improve health and wellness. Studies have demonstrated the importance of physical exercise in the prevention as well as the management of diabetes mellitus and other metabolic diseases (1,2,3). Walking in individuals with type 2 diabetes was shown to significantly reduce mortality rate (4). In another study, Anderson et al., (1) demonstrated that high levels of physical activity is associated with significantly reduced rates of mortality as a result of cardiovascular disease (CVD). The American diabetes association and American college of sports medicine published guidelines that provide specific exercise advice for individuals with type 2 diabetes (5). The third Report of National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) focuses on therapeutic lifestyle changes as the cornerstone of therapy for CVD (6).

Several studies investigating the effect of low intensity exercise published conflicting results,

with some reporting significant changes in lipoprotein metabolism (7,8,9) while some showed no changes in lipoprotein concentration (10,11). These variations may be due to exercise intensity and duration, and baseline lipoprotein levels. Therefore, we aimed to further investigate the effect of an eight weeks low intensity aerobic exercise on serum glucose and cardiometabolic risk markers in previously sedentary individuals.

Materials and Method

Chemicals and Reagents – All the chemicals and reagents used for this study were of analytical grade. Assay kits used for assaying biochemical parameters were purchased from Randox Laboratories, UK.

Participants and exercise programme – Twenty sedentary healthy adults (12 males and 8 females) were recruited to participate in the study. The mean age, body weight and body mass index (BMI) of the participants were 27± 3.4 years, 57.5±8.23 Kg and 21.20±2.27Kg/m^2 respectively. The mean systolic and diastolic blood pressures were 113±8.01 and 74.5±5.10mmHg respectively. The exercise programme involved brisk walking for 45 minutes 3 times per week for 8 weeks, completed under supervision. Inclusion criteria for participation were individuals who were apparently healthy with no sign of any sickness. Exclusion criteria for participation in the study was any history of cardiovascular disease, smoking, physically active lifestyle, medications and age above fourty years. Informed consent was obtained from the participants while ethical approval was granted by the Usmanu Danfodiyo University ethics committee.

Blood samples (10ml) were collected at baseline (24 hrs before commencement of exercise), or 48 hrs after the exercise programme. The blood samples were collected by venepuncture from the antecubital vein with minimal tourniquet into clean centrifuge tubes for serum collection.

Anthropometric measurements – Weight was measured using calibrated balanced-beam scale, with the participants wearing light clothes and bare footed. Height was measured using stadiometer, with the participants standing erect and bare footed with the movable head piece levelled with the skull vault. Blood pressure was measured using an automatic blood pressure gauge. BMI was calculated using the following formula: BMI = weight (kg)/height (m^2).

Biochemical analysis – Serum glucose was estimated by glucose oxidase method using Randox kit (12). Serum total cholesterol (TC) was estimated by enzymatic method using Randox kit (13). Serum high density lipoprotein cholesterol (HDL-C) was estimated by enzymatic method using Randox kit (14). Serum triglycerides (TG) were assayed using Randox kit by the method of Tietz (15). Serum low density lipoprotein cholesterol (LDL-C) and serum very low-density lipoprotein cholesterol (VLDL-C) were estimated using Friedewald formula (16).

Data analysis – All data are presented as mean ± standard deviation. Results are presented for 20 participants at baseline and after exercise. Parameters were analysed by one-way analysis of variance (ANOVA) using GraphPad Instant software. Statistical differences were considered significant at $P<0.05$.

Results

The result of the effect of low intensity exercise on anthropometric parameters is presented in Table 1. The result indicates that no significant ($P>0.05$) differences in anthropometric parameters of the participants after 8 weeks of exercise. However, a slight decrease was observed in systolic BP (baseline: 113.00 ± 8.01 mmHg, week 8: 108.50 ± 6.70 mmHg), diastolic BP (baseline: 74.50 ± 5.10 mmHg, week 8: 71.50 ± 3.66 mmHg), body mass (baseline: 57.50 ± 8.25 kg, week 8: 55.25 ± 7.79 kg) and BMI (baseline: 21.20 ± 2.27kg/m^2, week 8: 20.38 ± 2.10 kg/m^2) though not statistically significant ($P>0.05$).

The effect of low intensity exercise on lipid profile is shown in Table 2. The mean plasma total cholesterol concentration was significantly ($p < 0.05$) reduced after the eight-week exercise programme (baseline: 4.94 ± 0.40mmol/L; week 8: 4.43 ± 0.28mmol/L) compared to baseline. A significant ($p<0.05$) increase was observed in HDL concentration after the exercise regimen (baseline: 3.21 ± 0.52mmol/L; week 8: 2.34 ± 0.36mmol/L) compared to baseline. On the other hand, a non-significant decrease was observed in both plasma triglycerides and VLDL after eight week of exercise programme (triglycerides baseline: 1.74 ± 0.16 mmol/L; week 8: 1.65 ± 0.14mmol/L; VLDL baseline: 0.79 ± 0.07 mmol/L; week 8: 0.75 ± 0.06 mmol/L). Also, significant ($p<0.05$) changes were observed (between baseline and week four, baseline and week six) of both the total cholesterol, HDL, LDL and atherogenic index (AIX) while non-significant ($P>0.05$) changes were observed for both triglycerides, and VLDL after four- and six-weeks low intensity exercise.

The effect of low intensity exercise on serum glucose level is presented in Table 3. Blood glucose level was estimated at baseline and after four, six and eight weeks of exercise. The result indicated a significant ($p<0.05$) reduction in fasting blood glucose concentration after eight weeks exercise programme (baseline: 5.12 ± 0.32; week 4: 4.85 ± 0.28; week 6: 4.69 ± 0.23; week 8: 4.47 ± 0.26)

Discussion

There has been comprehensive data demonstrating the benefits of regular physical activity in the prevention, management and in some cases treatment of some of the most prevalent metabolic and life style diseases. These include obesity, diabetes mellitus and cardiovascular diseases (2,17,3). Thus, the current study investigated the effect of an eight-week low intensity exercise on anthropometric parameters, lipid profile and serum blood glucose in healthy sedentary individuals.

The study found no significant changes in body mass and BMI. This lack of changes is consistent with previous studies (18,19). The lack of significant changes in anthropometric parameters may be due to duration and population of the study subjects.

After completion of the eight weeks exercise, no significant changes were observed in both diastolic and systolic blood pressure. This result is in agreement with the study of Kelley and Tran, and Chan et al, (20, 21). However, the small reduction in blood pressure observed may play an important role in protection against cardiovascular diseases. This is so considering the fact that previous study showed that reduction in average blood pressure would reduce death from stroke and coronary heart disease in populations (22).

Plasma lipids play an important role in the development and progression of cardiovascular diseases. In this study there was a significant decrease in total cholesterol and LDL cholesterol in the participants. However, a non-significant increase in TAG was also observed. The observed decrease in total cholesterol in this study is in agreement with the study of (23) who reported a significant reduction of total cholesterol after 6 weeks of a walking programme. Exercise has also been shown to reduce plasma LDL cholesterol (24,25). These results were also in agreement with the current study. Thus, exercise increased the clearance of these lipids, hence, decreasing their concentrations in the circulation.

HDL cholesterol levels were found to be significantly increased after 8 weeks of participation in the exercise programme. One important lipid parameter for predicting coronary heart disease is the level of HDL cholesterol. HDL functions in transportation of cholesterol from the peripheral tissues and blood to the liver for excretion from the body (26). HDL cholesterol levels are inversely and independently associated with incidence of coronary heart disease. This inverse relationship may be attributed to increase

in HDL cholesterol levels observed following aerobic exercise (27,23).

Conclusion

This study indicates that eight-week low intensity exercise programme significantly modulates serum lipids and glucose levels in healthy sedentary subjects. Thus, walking may be beneficial in regulating lipid profile and blood glucose concentrations in sedentary individuals. More research is needed to further explore the beneficial effect of low intensity exercise in preventing cardiovascular diseases.

Conflict of interest: The authors declare no conflict of interest

Table 1: Anthropometric measurements at baseline and after 8 weeks of participation in low intensity exercise.

Week number	0	8
Weight (kg)	57.50 ± 8.25	55.25 ± 7.79
BMI (kg/m^2)	21.20 ± 2.27	20.38±2.10
Systolic BP (mmHg)	113.00 ± 8.01	108.50 ± 6.70
Diastolic BP (mmHg)	74.50± 5.10	71.50 ± 3.66

Data is presented as mean ± SD (n=20). BMI=body mass index; BP = blood pressure.

Table 2: Effect of low intensity exercise on plasma lipids and lipoprotein levels at baseline and after 8 weeks of participation in the low intensity exercise.

Week number	0	4	6	8
Lipids		Concentrations (mmol/L)		
TC	4.94 ± 0.40	4.55 ± 0.29*	4.48 ± 0.30*	4.43 ± 0.28*
LDL-C	3.21 ± 0.52	2.51 ± 0.38*	2.41 ± 0.37*	2.34 ± 0.36*
HDL-C	0.98 ± 0.24	1.27 ± 0.16*	1.30 ± 0.14*	1.35 ± 0.13*
VLDL	0.79 ± 0.07	0.78 ± 0.07	0.78 ± 0.06	0.75 ± 0.06
TAG	1.74 ± 0.16	1.72 ± 0.14	1.72 ± 0.13	1.65 ± 0.14
AIX	3.64 ± 1.08	2.02 ± 0.42*	1.89 ± 0.39*	1.76 ± 0.36*

Values are expressed as mean ± Standard deviation (n = 20). *Denotes significant ($p<0.05$) difference between week 0, 4, 6 and 8. **TC**= Total Cholesterol; **HDL-C** = High density lipoprotein cholesterol; **LDL-C** = Low density lipoprotein cholesterol;**VLDL-C**=Very low density lipoprotein cholesterol; **TAG**= Triglycerides; **Aix**=Atherogenic Index

Table 3: Effect of low intensity exercise on serum glucose levels at baseline and after 8 weeks of participation in the low intensity exercise.

Week number	0	4	6	8
Glu (mmol/L)	5.12 ± 0.32	4.85±0.28	4.69 ± 0.28*	4.47 ± 0.26*

Data is presented as mean ± SD (n=20). Glu=glucose. *Denotes significant ($p<0.05$) difference between week 0, 6 and 8.

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