Pampana Gouda
Physical Education Director,
SSA Govt First Grade College,
Ballari, Karnataka, India

Effects of different intensities of aerobic running on the resting state blood glucose, platelet account and plasma fibrinogen among type II diabetics

Pampana Gouda

Abstract
Objective: Biological mechanisms mediating the effect of physical activity on the risk of coronary disease and stroke are not well established. We aimed to determine the effects of aerobic exercise and training on coagulation, platelet aggregation, and plasma lipids in healthy young adults.
Methods: Sixteen subjects (mean age 26±4 years, 13 females) participated in a six-week low-impact, moderate-intensity aerobic exercise program. Platelet aggregation studies, Proteome international normalized ratio (PT INR), activated partial thromboplastin time (apt), and plasma lipid determination were performed at baseline, after one exercise, after six weeks of training, and after two weeks of deconditioning.
Results: After one session of exercise, mean platelet aggregation, aPTT, and PT INR did not change from baseline levels. After six weeks of training, however, we observed significant inhibition of ADP- and collagen-induced platelet aggregation in all participants ($p < 0.0001$) with prolongation of mean aPTT ($p < 0.01$) and PT INR ($p < 0.0001$). These effects persisted even after two weeks of deconditioning. Regardless of exercise, training or reconditioning, concentrations of total cholesterol, triglyceride, HDL-C, and LDL-C were not significantly different from baseline levels.
Conclusions: Regular aerobic exercise elicited significant inhibition of ADP- and collagen-induced platelet aggregation as well as prolongation of PT INR and aPTT values, without significantly altering lipoproteins. The changes induced by training persisted even after two weeks of deconditioning.

Keywords: Exercise, training, blood glucose, blood coagulation, platelet aggregation, lipid profile, plasma fibrinogen

Introduction

Optimum health and quality of life may be linked to maintaining proper physical fitness and lifestyle. Lifestyle need to be changed to improve health and fitness through daily exercises. Aerobic exercise stimulates the heart, lungs and all working groups of muscles and produces beneficial changes in body and mind. Many physiological changes are determined by daily aerobic exercises. Aerobic exercise can lower the foe type 2diabetes.Exercise has positive benefits for those who have diabetes. It can lower blood sugar levels, improve insulin sensitivity, and strengthen the heart and vascular efficiency. Occurrence of degenerative diseases like Hypertension, Atherosclerosis etc is inversely related to physical activity involvement. Decreasing physically the cardiovascular diseases like Hypertension, Atherosclerosis, Coronary Heart Diseases and Metabolic Disorders like Diabetes Mellitus.
The purpose of the study is to investigate, analyze and understand the effect of selected different intensities on aerobic running on resting state blood glucose, blood platelet count and plasma fibrinogen over a period of four months on the precipitating factors which are considered as degenerative diseases like macro vascular and micro vascular complications on the previously untrained adult men in the age group of thirty five to forty with type II diabetes.
The study included 63.0% women and 47.3% non-white participants who had a mean (SD) age 'of 55.8 years (8.7 years) with a baseline HbAlc level of 7.7% (1.0%). Compared with the control group, the absolute mean change in HbAlc in the combination training exercise group was-0.34% (95% confidence interval [CI], -0.64% to -0.03%; P = .03). The mean changes in HbAlc were not statistically significant in either resistance training (-0.16%; 95% CI, -0.46% to 0.15%; P = 32) or the aerobic (-0.24%; 95% CI, -0.55%). 0.07%; P = 14) groups compared with control group.

Corresponding Author:
Pampana Gouda
Physical Education Director,
SSA Govt First Grade College,
Ballari, Karnataka, India

Only the combination exercise group showed improved oxygen consumption (mean, 1.0 mL/kg per min; 95% CI, 0.5-1-5, *P* < .05) compared with the control group.

Methodology
A total of one hundred type 2 diabetic individuals in the age group of thirty five to four years, who volunteered for physical exercise programs as a treatment protocol for control their diabetes biomarkers, were taken for the study, Only the blood glucose levels were considered a baseline control variable and only such individuals were included with postprandial blood glucose of 190 to 200 mg/dl. Other criterion variables were resting plasma fibrinogen and resting blood platelet level. The individual's were randomly assigned to five different groups. There were four activity groups and one control group those who were assigned to the control group were promised that they would be given appropriate exercise program to reduce their disease status after conclusion of the study and were asked to cooperate during the five months. All individuals continued with their medication along with the aerobic running assigned to them. One group underwent low intensity aerobic running, second group underwent medium intensity aerobic running, third group underwent sub maximal aerobic running and fourth activity group underwent maximal aerobic running activity

for five months. The experimentation period was five months in which the first month was mostly like orientation to the individuals, To facilitate the individuals of the study to be very precise on their training intensity, all subjects were advised to posses the heart rate monitors.

Criterion Variables for the Experiment
The criterion variables selected for the experimentation were resting state of Blood Glucose, Blood Platelet Count, and Plasma Fibrinogen. Effect of the selected constant intensity aerobic exercise and increasing anaerobic threshold levels was tested on these variables.

1. Resting State Blood Glucose
Blood glucose was obtained from subjects using blood glucometers, with the help of qualified biochemists in the biochemical lab. A glucose meter (or glucometer) is a medical device for determining the approximate of glucose level in the blood. It is also known as home blood glucose monitoring (HBGM) by people with diabetes mellitus or hypoglycaemia. A small drop of blood, obtained by pricking the skin with a lancet, is placed on a disposable test strip that the meter and reads and uses to calculate the blood glucose level. The meter then displays the level in mg / dl or mmol / l.

Table 1: Blood Sugar Levels Chart

Type of person	Fasting Value		Post Prandial
	Min value, Mg	Max value, mg	Value2 hours after consuming glucose
Normal	72 mg / dl	100mg/dl	Less than 140mg / dl
Early Diabetes	101mg / dl	126mg / dl	140mg to 200mg / dl
Established Diabetes	More than 126 mg / dl	-	More than 200 mg / dl

2. The Blood Platelet Count
The platelets were counted using the RBC/Platelet ratio method as specified by the International Council for Standardization in Haematology (ICSH) and the International Society of Laboratory Haematology (ISLH). Recommend the counting of specifically labelled platelets relative to the RBCs with a fluorescence flow cytometer, together with an accurate RBC count determined with a semi-automated, single - channel aperture - impedance counter as a reference method for the enumeration of platelets. Fresh EDTA – anti coagulated venous blood specimen's are measured within 4 hours of the draw. The specimen is prediluted (1:20) and the platelets are labelled with two monoclonal antibodies specific to a cluster of differentiation common to all platelets. A final 1: 1,000 dilution is made and at least 50,000 events with a minimum of 1,000 platelet events are counted with a flow cyrometer determine with an RBC / platelet ratio. The platelet count is then calculated from this ratio and the RBC concentration of the original blood specimen.

3. Plasma Fibrinogen
Concentration of Fibrinogen in Plasma was determined quantitatively by the Claus clotting method'. This test method measures the rate of fibrinogen to fibrin conversion in the diluted sample under the influence of excess thrombin. Clot detection by the STA – Compact involves an electromagnetic Mechanical System. The oscillation of a steel ball within the curette with the thrombin and diluted plasma is monitored by the STA - Compact. When the oscillation of the steel ball is stopped by the clot formation, the sensor registers in seconds. The time is translated into fibrinogen concentration from a fibrinogen standard curve, stored on the STA compact.

Resting plasma fibrinogen levels of the individuals of the study twenty-four hours before the start of the experimentation and twenty four hours after the conclusion of the experimentation.

Independent or experimental variable
Aerobic running were assigned to four different groups on the Karvonen's target Heart Rate Reserve (HRR) percentage as the intensity for the aerobic running. Heart rate reserve (HRR) is the difference between resting heart rate (RHR) and maximum heart rate (MHR). HRR = MHR - HR rest. MHR = 220 - age. Heart rate reserve is used for aerobic running for the target exercise intensity for aerobic running the formula proposed by Karvonen is used to calculate the target heart rate of aerobic running and to determine the exercise heart rate or given percentage training intensity.

Target heart rate = percentage of target intensity (MHR - HR rest) = HR rest.
For example: Target intensity of 70% of heart rate reserve for a person with MHR of 201 and HR rest 50 = 70% (201-50) = 50 = 155 beats per minute.
Target intensities were fixed as following intensities for four groups of experimentation.
Low intensity aerobic running group45-55% heart rate reserve was kept as target intensity for low intensity aerobic running group.
Medium intensity running group: for 55 to 65% heart rate reserve was kept as target intensity for Medium intensity aerobic running group.
Sub-maximal intensity running group: above 65-70 heart rate reserve was kept as target intensity for sub-maximal intensity aerobic running group.

Maximal intensity running group: Above 70 - Up to 75% heart rate reserve was kept as target intensity for sub maximal intensity aerobic running group.

Hence, the target heart rates were fixed basing on every month ending resting heart rate and hence the target heart rates were set for four times in the five months of experimentation for each individual of study.

Each individual study did a target heart rate running for thirty to forty five minutes at least three times in a week. The individuals running for five months independently but the supervisor monitored regularly the running programs of the individuals of the study. Since then, individuals resided in different areas of Anantapur and adjacent small towns, the supervisor has conducted regular visits to the individual personally and advised about their running program and had clear unambiguous control over the individuals running program.

Measuring of variables and statistical procedure for hypotheses testing

The criterion variables were the measured baseline i.e. one day before commencement of orientation period and post training values of the criterion variables were measured one day after the conclusion of the five-month experimentation period. ANCOVA was used to find out whether there were any significant effects of aerobic running of different intensities on selected criterion variables *viz* resting blood glucose level, platelet count and plasma fibrinogen levels. Scheffe's post hoc individual comparison test was also conducted to find out which particular experimental group showed significant difference in the selected criterion variables in comparison with the other activity groups and to test the hypothesis 0.05 level of significance is used to test the statistical derivatives.

Results

The selected different intensities of aerobic training of caused significant change in the selected criterion variables.

Medium and sub-maximal intensity aerobic training caused more significant changes in selected criterion variables when compared to the other two selected intensities of *viz* low and maximal intensity aerobic running.

References

1. Simoes HG, Hiyane WC, Benford RE, *et al*. Lacatae threshold prediction by blood glucose and rating of perceived exertion in people with type 2 diabetes. Percept Mou Skills. 2010;111:365-378.
2. Felig P, Wahren J, Hendler R, *et al*. plasma glucagon levels. In Exercising man N Eng J Med. 1972;287:184185.
3. Kjaer M, Engfred K, Fernandes A, *et al*. regulation of hepatic glucose production during exercise in Humans role in sympathoadrenergic activity. Am J Physiol. 1993;265:E275-E283.
4. Rose AJ, Richter EA. Skeletal muscle glucose uptake during Exercise: how it is regulated. Physiology. 2005;20:260-27.
5. Dr. Vittal BG, Dr. Abhijith D. Fasting and non-fasting lipid profile: A comparative study. Int. J Adv. Biochem. Res. 2021;5(1):06-08. DOI: 10.33545/26174693.2021.v5.i1a.56
6. Prud'homme D, Bouchard C, Leblance C, *et al*. Reliability Assessments of Ventilatory Thresholds. J Sports Sci. 1984;2:13-34.
7. Simoes HG, Campbell CSG, Kokubun E, *et al*. Blood glucose responses human mirror lactate responses for individual anaerobic threshold and lactate minimum Track tests. Eur J Appl Physiol. simoes HG, Campbell CSG. 1999;80:34-40.
8. Kushnick MR, *et al*. Blood glucose threshold and metabolic responses to incremental. Exercise tests with and without prior lactic acidosis induction Eur J Appl Physiol. 2003;89:603-611.
9. Ribeiro LF, Malachias PC, Junior PB, *et al*. Lactate and glucose minimum speeds and running performance. J Sci Med Sport. 2004;7:123-127.
10. Rocha C, Canellas A, Monteiro D, *et al*. Changes in individual glucose thresholds during Military training. Int J Sports Med. 2010;31:482-485.
11. Sengoku Y, Nakamura K, Takeda T, *et al*. Glucose response after a ten - week training in. Swimming. Int J Sports Med. 2011;32:835-838.
12. Junior PB, Neiva CM, Denadia BS. Effect of an acute B - adrenergic blockage on the blood glucose resoonse during lactate minimum. J Sci Med Sport. 2001;4:257-265.
13. Sotero RC, Pardono E, Landwehr R, *et al*. Blood glucose minimum predicts maximal lactate steady state on running. Int J Sports Med. 2009;30:643-646.
14. Wasserman K, Hansen JE, Sue DY, *et al*. Principles xercise Testing and Interpretation. 4th ed. Baltimore: Lippincott Williams & Williams, 2004.
15. Beaver WL, Wasserman K, Whipp BJ. Anew method for detecting anaerobic threshold by Gas exchange J Appl Physiol. 1986;60:2020-2027.
16. Barry Franklin A, James Wappes R. Exercise for heart patients; optimal options: The physician and sports medicine. 1998;26(10).
17. Akbartabartoori M, Lean ME, Hankey CR. The current recommendation between associations with physical activity and cardiovascular risks associated with obesity. Eur J Clin Nutr. 2008 Jan;62 (1):1-9.
18. Wasserman K. The anaerobic threshold measurement in exercise testing. Clin Chest Med. 1984;5:77-88.