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Revista de Antropología, Ciencias de la Comunicación y de la Información, Filosofía, Lingüística y Semiótica, Problemas del Desarrollo, la Ciencia y la Tecnología

Año 34, 2018, Especial N° 16

Revista de Ciencias Humanas y Sociales
ISSN 1012-1587/ ISSNe: 2477-9385
Depósito Legal pp 198402ZU45

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Opción, Año 34, Especial No.16 (2018): 32-49
ISSN 1012-1587/ISSNe: 2477-9385

The effect of aerobic on the Hemocystein and respiratory selective factors Levels

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Abstract

The purpose of the present study is the examination of the effect of aerobic exercises on the level of Hemocystein and on the respiratory selective factors of inactive middle-aged men suffering from the type two of diabetes via the covariance analysis in statistical tests. The findings showed that there are some significant differences between the two groups in respiratory factors but there are not any significant differences in the amount of Hemocystein. In conclusion, people suffering from the second type of diabetes can be recommended to use the aerobic exercises as the effective.

Key Words: Aerobic Exercises, Diabetes, Hemocystein, Respiratory.

Recibido: 04-12--2017 •Aceptado: 10-03-2018

El efecto del aeróbico en los niveles de hemocisteína y factores selectivos respiratorios

Resumen

El propósito del presente estudio es examinar el efecto de los ejercicios aeróbicos en el nivel de hemocisteína y en los factores selectivos respiratorios de los hombres inactivos de mediana edad que padecen diabetes tipo dos a través del análisis de covarianza en pruebas estadísticas. Los hallazgos mostraron que hay algunas diferencias significativas entre los dos grupos en los factores respiratorios, pero no hay diferencias significativas en la cantidad de hemocisteína. En conclusión, se puede recomendar a las personas que padecen el segundo tipo de diabetes que utilicen los ejercicios aeróbicos como efectivos.

Palabras clave: ejercicios aeróbicos, diabetes, hemocisteína, respiratorio.

1. INTRODUCTION

Cardiovascular diseases are about half of the reasons of death in traditional and industrial societies. Many factors have been recognized in the presence of these diseases, among which atherosclerosis, insulin resistance, obesity, lipid disorders, inappropriate concentrations of lipoproteins, inactiveness, smoking, stress and also increase in the level of Hemocystein can be mentioned. Hemocystein is the amino acid which consists of sulfur and is the result of Methionine Metabolism. Based on the studies of epidemiology, an increase of Hemocystein was associated with the risk of cardiovascular diseases and its high level in the precursor of complications such as venous thrombosis, embolism and atherosclerosis. Also, the Hemocystein level in the blood is related

to the total cholesterol, heart rate and blood pressure. In a way that the increase of 5 micromil in a liter of Hemocystein almost leads to increase of about 20 mg in deciliter of the level of total plasma cholesterol and independent risk factor for coronary arteries. There are also different factors such as sex, age, medicine, genetics, drinking alcohol, smoking, deficiency of B-group vitamins and inactiveness which have an effect on the level of plasma Hemocystein.

For example, intensive physical activities lead to the sharp increase of Hemocystein and a slight increase of this variable is due to the long term of physical activities with moderate intensity. Subas (2009) has reported the lack of significant increase of Hemocystein after one session of resistance exercises with moderate intensity and he has also reported the presence of significant increase of this variable after one session of aerobic exercises below the maximum. However, some other studies have known that sport exercises are effectively less in changing the Hemocystein levels. The level of Plasma Hemocystein has an inverse relationship with physical mobility and regular sport activities. Dehghan et al. (2009) have observed the significant decrease in the level of Hemocystein of older non-athlete female after eight weeks of aerobic exercises. In return, another group of studies does not support the existence of relationship between physical activity and the level of Hemocystein in blood. As Subas et al. (2012) did not observe any significant changes in the levels of Hemocystein in blood and the lipid profile of male and female after twelve weeks of combined exercises.

Paziraei (2012) did not find any significant changes in the level of Hemocystein in blood in the elderly male after eight weeks of aerobic exercises. In return, Moghadasi et al. (2010) after six weeks of fast walking and Guzel (2012) after eight weeks of light exercises have observed the decrease in lipid profile and the increase in the level of Hemocystein. In this regard, different findings of different studies have confirmed that intensity, type and duration of physical activities have an effect on Hemodynamic parameters and pulmonary factors. The most of the studies which have been done about the effects of physical activities and sport on the level of Hemocystein and pulmonary factors were accompanied by contradictory findings. So there are many questions and ambiguities about the type and the intensity of sport activities which is suitable for diabetics and heart patients. However, nowadays, aerobic and combined exercises are used by therapists and researchers as common and approved practices. In a way that in some of these studies, the positive effects of combined exercises on the improvement of body composition and pulmonary variables has been mentioned.

Diabetes and specifically the second type of diabetes is one of the most common endocrine diseases especially in the present age that is along with the expansion of inactive and sedentary lifestyles. This disease is one of the main reasons of death in today's societies and its numerous complications can lead to imposing of heavy costs on the health system. Among these complications, respiratory disorders, cardiac disorders, diabetic foot ulcer, amputation, blindness, renal and neurological complications can be mentioned. Based on the findings of

the studies, airflow limitation and reduction of respiratory capacities inn diabetic patients correlate with the increase of their blood sugar, in a way that the obstruction of respiratory tracts along with other known complications of this disease, increases the dangers of death in these patients.

Lung due to having connective tissue and extensive blood circulation is affected by the increase of blood sugar. In a way that the significant decrease in pulmonary capillaries, due to the chronic increase of blood sugar leads to respiratory diseases. As the research findings approve that the respiratory dysfunction of the independent diabetics is due to factors such as obesity and smoking. In this context, the researchers have found the significant relationship between the levels of glycosylated hemoglobin, type A1C (HbA1C) with the Forced Vital Capacity (FVC) and Forced Expiratory Volume in 1 second (FEV_1). The findings of the British center for heart studies and health have shown that due to diabetes and insulin resistance, the amounts of FEV_1 and FVC will reduce. That is why in recent years, the reduction of mentioned pulmonary factors in clinical studies of diabetic patients is taken into consideration. Specifically, FVC is from the dynamic pulmonary volumes and consists of inhale, exhale and current storage volume, while FEV_1 shows the total pulmonary capacity, reduction of the elasticity of the lung, airway obstruction and inadequate growth of respiratory muscles.

Based on the pathological findings, the respiratory dysfunction mechanism in diabetic patients is usually related to histological

changes such as the increase if the thickness of alveolar wall and its capillaries and also the thickness of the lining of the arterioles of the lungs, hyperglycemic, stress and oxidative inflammation. In a way that, these factors gradually lead to the reduction of the elasticity of the respiratory muscles and the associated capacities and also the increase in pulmonary load and high energy consumption for the respiratory changes. The mentioned complications are highly increased in inactive and obese people and according to the beliefs of researchers, the growing trend of the complications of the disease such as respiratory disorders can be controlled by moderating the risk factors for diabetes, such as performing regular exercises, improving body composition and reducing the blood sugar fluctuation. The known effects of regular sport exercises in the improvement of muscle performance, metabolic factors and reduction of fat mass lead to the utilization of these exercises in therapeutic interventions and diabetic patient rehabilitation programs. As Emamdoost & Faramarzi (2015) showed that the aerobic exercise leads to an increase in variables such as FEV_1 and FVC.

Dehghan et al. (2009) have reported the effectiveness of aerobic and resistance exercises on the improvement of the performance of type two diabetic patients. In this regard, Nandhini (2012), Puhan (2005) have recommended the aerobic exercises as the most appropriate exercise in the treatment and the reduction of the complications of diabetes. Overall, with regard to the few researches which exist about the effect of aerobic exercises on the level of Hemocystein and pulmonary profile, the simultaneous study of the effects of this method of practice on the mentioned variables could be

justified and also can be considered as an effective intervention in the risk factors of cardiovascular diseases and diabetes. Considering the mentioned cases, the purpose of the present study was to examine the effects of an aerobic training course on the level of Hemocystein and on the respiratory selective factors of middle-aged men suffering from the type two of diabetes.

2. METHODOLOGY

The present study is semi-experimental with two groups of control and experiment and uses pre-test and post-test method. The statistical population of the research includes all the middle-aged men suffering from the type two of diabetes in Karaj city with the age range of 45 to 55. From the aforementioned statistical population, 30 volunteers who have had no regular sport activities in the past year and have the related evidences of clinical diagnosis of the second type of diabetes by an endocrinologist were selected as the research sample. The research sample has the Body Mass Index (BMI) average of 30.12 and Fasting Blood Sugar (FBS) higher than 169 mg on deciliter. According to the statements of the participants, they did not use any drugs except oral blood sugar-lowering medicines. Also, they did not have the history of smoking and the special complications of diabetes like diabetic foot ulcer and severe renal and visual disorders. Initially by holding briefing sessions, the purposes and the study methods were determined for the volunteers who declared readiness through public call and with the participation of two endocrinologists working in

Karaj city hospitals. The participants were assured that their information would be completely confidential. Also, it was still possible for them that for any reason and in the absence of a desire to give up to continue cooperation.

In the next step and after obtaining a commitment and signing consent form and completing the questionnaire related to the demographic information, disease backgrounds and sport activities backgrounds, they were introduced to the trusted laboratories for doing the Fasting Blood Sugar (FBS) test and Espirometry. In the next stage, the understudied samples were randomly divided into two groups of experimental group (15 people) and control group (15 people).

The experimental group was practiced and trained for about twelve weeks. The aerobic exercise program included twelve weeks of running on the treadmill with the form of three sessions per week. Each exercise session started with 60 to 65 percent HR_{max} after 10 minutes warming up with fast walking and slow running. The program of the first session included 15 to 20 minutes running and reaching into the 60 to 75 percent of HR_{max} for about 25 to 30 minutes. In order to observe the principal of overload exercise, the exercises of the third week was accompanied with 75 to 85 percent of HR_{max} and increasing the time of exercise to 35 to 40 minutes and this method was continued to sixth week. During the seventh week, the HR_{max} increased to 80 to 85 percent and the time of exercise to 45 to 50minutes and this process continued to twelfth week. At the end of each exercise session, the

slow cool down with stretching movements for about 10 minutes had done.

For controlling the exercise intensity, the relationship between HR_{max} based on the age and Kornen Formula (HR_{max} = 220- age) was used. All stages and exercise sessions were done by the presence and guidance of researchers and in accordance with the standard medical protocols. The understudied samples were strongly recommended to go to the laboratories for measuring the plasma variables (Hemocystein and blood sugar) after 12 hours of fasting and to avoid doing intensive physical activities until 24 hours before measuring the studied factors in pre-test and post-tests. The participants were also asked not to change the diet and medication during the study period and if they are required to do that, surely inform the researcher. To measure the weight, the Satyr model with the precision of 0.1 kg and to measure the height, the tape meter with the accuracy of 0.1 cm were used.

The Body Mass Index (BMI) was also calculated by dividing the weight by squared height. The levels of rest of Biochemical variables of Hemocystein were measured by the AXIS kit with the method of ELISA; the pulmonary factors also were measured by the use of Espirometric device, the alpha Touch model. For considering the changes of the pulmonary capacities during the day and also for minimizing and controlling these changes, the Espirometry had been done in two consecutive days with the time interval of 10 a.m. to noon. For each patient, the Espirometry had been repeated 3 times and the best obtained result was recorded. Also the amount of Fasting Blood

Sugar (FBS) was measured by the use of photometric method and the use of Pars Azmoon kit which have been done by the auto analyzer machine, 1000-RA model. The results of this study were estimated based on the mean and standard deviation factors. To compare the differences between two understudied groups, the t test and covariance analysis were used. The significant level in all participants was considered as $p \leq 0.05$ and the statistical software of SPSS, version 22 was used.

3. FINDINGS

In Table 1, the mean and the standard deviation of the studied descriptive variables in two groups of experimental and control has been presented.

Table1. The Mean and the standard deviation of the studied descriptive variables in two groups of experimental and control

Group	Height (m)	Weight (kg)	Age (year)	Body Mass Index (BMI)	$VO2_{max}$ (ml.kg-1min-1)	Blood glucose
experimental	1.74±5.15	81.65±5.87	47.8±3.5	29.68±4.25	41.12±4.34	162.25±28.84
control	1.73±6.5	79.82±5.32	49.2±5.2	30.56±4.82	42.6±5.75	171.75±15.45

Based on the contents of Table 1, the mean and the standard deviation of the factors such as height, weight, Body Mass Index (BMI), Maximum Oxygen Volume ($VO2_{max}$) and Blood glucose in the two groups of control and experimental are I the same range and close together. To compare the mean and the standard deviation of the under studied variables, the t test was used. (Table 2)

Table 2. The comparison of the mean and the standard deviation of the levels of Hemocystein and the respiratory selective factors in pre-test and post-test of the experimental and control groups

Variable	stage	Control group		Aerobic exercise	
		the mean and the standard deviation	sig	the mean and the standard deviation	sig
Hemocystein	Pre-test	11.33±0.96	0.64	11.39±0.66	0.85
	Post-test	11.45±0.46		11.47±1.06	
FVC	Pre-test	2.92±0.11	0.57	2.88±0.14	0.00
	Post-test	2.88±0.15		3.18±0.11	
FEV_1	Pre-test	2.58±0.11	0.36	2.58±0.1	0.00
	Post-test	2.64±0.27		3.02±0.09	

The findings of Table 2 confirm that the differences between the mean in the levels of Hemocystein in pre-test and post-test of the two understudied groups after the twelve weeks of aerobic exercise were not significant. However, a significant increase was observed in FVC and FEV_1 related to the pulmonary selective factors in the participants

of the experimental group which was affected by the aerobic exercises in comparison to the control group.

4. CONCLUSIÓN

This study investigate the effect of twelve weeks aerobic exercises on the levels of Hemocystein and pulmonary in inactive middle-aged men that they are suffering from the type two of diabetes. The mentioned exercises after twelve weeks did not cause any significant changes in the levels of Hemocystein of the two understudied groups. Few studies have been done about the effect of aerobic exercises on the risk factors of cardiovascular diseases such as Hemocystein factor. In addition, the review of the recent studies indicates a contradiction in the findings of the studies which had been done about this variable. As Ghanbarzadeh et al (2009) have found the inverse and significant relationship between the average of the levels of Hemocystein and the amount of physical activity. Based on this report, the levels of Hemocystein in the blood in people with intense and moderate physical activities are lower than inactive people.

In this regard, Konig et al (2003) have observed that the level of plasma Hemocystein after eight weeks of exercise with high and moderate intensity decreased only in the group which had experienced the intensive exercises. While, Moghadasi et al (2010) have observed the increase in level of Hemocystein in the group which they have walked for six weeks. Some of the researchers consider the strength

exercises to be related to the mechanism of increasing the amino acids in the muscles and reducing blood Hemocystein levels. Some other researchers have seen the aerobic exercises with high intensity to be effective in reducing the concentration of Hemocystein. In contrast to the mentioned researches, Mohammadzadeh et al (2007) and Razavi et al (2012) have known the intensive and extreme endurance exercises such as Marathon running to be effective in increasing the Hemocystein level. So, according to the reviewed studies, it seems that the effects of physical and sport activities on the plasma Hemocystein changes are probably related to the factors such as the type of the sport exercise, intensity, duration, sex, inheritance and nutrition. For example, Ortega (2002) believes that the exercise with high intensity leads to the increase in the methyl group turnover and production of Methionine and also during the special process leads to the increase in the production of Hemocystein (Khasanzyanova et al., 2018).

In the present study, the lack of significant in the level of Hemocystein of participants is probably due to the length of the exercise period and its intensity. Although it has been tried to control factors such as age, sex, food supplement consumption, drug and diseases like diabetes as much as possible, some other disruptive variables such as diet, smoking, overweight and genetic features which were out of the control of researchers can justify the lack of significant changes in the level of Hemocystein in understudied groups. Physical activities in general and sport exercises in particular and independently are related to the reduction in the risk of cardiovascular diseases; Perhaps part of this reduction in risks is due to the desired changes that

happen in the respiratory profile of active people. As in this study, the effect of twelve weeks of aerobic exercises leads to a significant increase in FVC and FEV_1 in participants. This finding is consistent with the findings of the studies of Rashidi et al (2016) which examined the effect of twelve weeks of aerobic and resistance exercise on respiratory function of the people suffering from the second type of diabetes, with the findings of Fesharaki et al (2010) who examined the effect of ten weeks of aerobic and combined exercises on the pulmonary volumes of patients suffering from Asthma and they observed a significant increase in FVC and FEV_1 and also with the findings of Mahdizadeh et al (2015) who have confirmed the effect of resistance exercises on the improvement of pulmonary factors in women with obesity and type two diabetes. FVC is one of the dynamic respiratory volumes that depends on the variables such as age, body composition, health status and physical activity level of people. This factor is also affected by the respiratory muscle strength and chest compliance.

Beside the mentioned variables, the amount of pulmonary volume reduction and airflow restriction is in a relationship with blood sugar and fat. In a way that the increase of FVC after aerobic exercises, exactly like the thing that has happened in the present study can be attributed to the improvement of the strength and endurance of respiratory muscles and also reduction of blood sugar and fat in participants. The respiratory factor of FEV_1 represents a percentage of FVC that is removed from the lungs with a deep exhalation in the first second. This factor in the present study has experienced a significant

increase due to the effect of twelve weeks of aerobic exercises. This finding is consistent with the findings of the studies of Fesharaki et al (2010).

This inconsistency can be attributed to the variables such as sex of the participants, age, type of exercise program, duration of the exercise and inheritance. Reduction in FEV_1 indicates the reduction in pulmonary capacity, the occurrence of an obstruction in respiratory tracts, reduction of elasticity and insufficient respiratory muscle growth. So by improving the strength of the respiratory muscles such as that which probably is due to the aerobic exercises, FEV_1 will also increase. On the other hand, the reduction in lipid variables and fat in the abdominal region may be related to the increase of chest expandability and respiratory muscle reversibility in the improvement of $FEV_{1.}$ It seems that the improvement of respiratory function and lipid profiles in diabetic patients after the aerobic exercises was related to the correction of glucose metabolism and the amount of this correction undeniably depends on the length of the exercise period. So based on the result of the present research and the review of the literature, the presented aerobic exercises would be taken into consideration as an effective treatment intervention for the people suffering from the second type of diabetes.

Since the mentioned exercises without manipulating the diet and medicines of the participants lead to the significant reduction in the level of blood glucose and the improvement of the respiratory factors and also play a significant role in controlling the risk factors for

cardiovascular diseases. Hence, people suffering from the second type of diabetes can be recommended to use the aerobic exercises as the effective, low-risk and low-cost along with other interventions and clinical treatments for preventing and relieving the complications of this disease.

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Revista de Ciencias Humanas y Sociales

Año 34, Especial N° 16, 2018

Esta revista fue editada en formato digital por el personal de la Oficina de Publicaciones Científicas de la Facultad Experimental de Ciencias, Universidad del Zulia.
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