Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 5 [12] November 2016: 23-27

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE **OPEN ACCESS**

The Effect of one Anaerobic Practice Session on the Serum BNP Levels in Healthy Male Athletes and Non-athletes

Shahd Kiyani [1], Asghar Nikseresht [2]

1. Department of Physical Education and Sport Sciences, Jahrom Branch, Islamic Azad University, Jahrom, Iran
2. Department of Physical Education and Sport Sciences, Jahrom Branch, Islamic Azad University, Jahrom, Iran

Email: nikseresht66@yahoo.com

ABSTRACT

In recent decades the study of cardiac markers of serum plasma is started to determine the prognosis of heart attacks and the incidence of heart failure and the risk of death. Studies show that heart releases a peptide substance called BNP (Brain Natriuretic Peptide) as an endocrine gland. This study was conducted with the aim of determining the effect of an anaerobic practice session on serum BNP in healthy male athletes and non-athletes. For this purpose, 30 young men (15 athletes and 15 non-athletes) with the age range of 22-18 years were selected. Both groups performed Rast anaerobic test; this means that they ran with the maximum speed at embedded distances in each 35 meters and there was 10 seconds rest between each distance. 10 minutes before and immediately after the activity, blood sampling was taken to measure serum BNP. Data was analyzed by using Spss software (version 16), descriptive statistic, independent t-test, t-dependent and covariance analysis at the significant level of $P \leq 0.05$. Results showed that there was no significant difference among athletes and non-athletes in terms of baseline values of serum BNP and one session of anaerobic activity increased the level of serum BNP in both groups. This increase is higher in group of non-athletes than the group of athletes and its possible reason is the compatibility of athletes to exercise and larger size of their heart cavity.

Keywords*: anaerobic exercise, BNP, athletes, non-athletes.*

Received 25.07.2016 Revised 16.09.2016 Accepted 21.10.2016

INTRODUCTION

At present, heart diseases are one of the main threats of health in human society. Despite efforts to control these diseases, especially in developed countries, it's estimated that by 2020, the cardiovascular diseases be the leading cause of reduction in useful performance of individuals due to the disability and premature death throughout the world [1]. Also, heart failure imposes a severe economic burden on health care systems because of the hospitalization and disability costs. Daily, most doctors assess the disease severity and their treatment by relying on clinic and echocardiography. Although, these days, echocardiography is the gold standard for diagnosing the left ventricular dysfunction, but it has constraints due to the costs and access restrictions in emergency cases.

Patients with shortness of breath may not have the necessary cooperation during echocardiography, in addition, the technical problem caused by obesity and lung disease cannot provide a good image for the examination of echocardiography. So, even if echocardiography be available, the measurement of plasma level (NT-pro BNP) is a useful tool for evaluating the left ventricular dysfunction and heart failure [2].

Sports is known as an effective therapy method for increasing the efficiency of cardiovascular system and curb the rise in systolic blood pressure in patients, heart poly-peptide hormones and very powerful vasodilators. These hormones are released from the atriums and ventricles of the heart and are responsible for controlling the water, sodium, potassium and fat tissue in response to increase in blood pressure. Natriuretic peptide hormone is naturally in the body [3]. This peptide can reduce the concentration of sodium in blood through urinary excretion and decreases the volume of blood and could be secreted through heart and blood vessels during heart, kidney or liver failure [4]. Natriuretic peptide is called brain peptides. It is synthesized in ventricular myocardial cells. Natriuretic peptide is secreted from the heart ventricles in human. But, it is called brain peptides because it was first extracted from the

brain of a pig. The brain natriuretic peptides are released due to the pressure on the walls and ventricular dilatation of heart and also due to the increase in blood pressure. Plasma level of brain natriuretic peptide rises as a heart neural hormone in patients suffering from dysfunction of systolic and diastolic ventricular and it has a high sensitivity for diagnosing heart failure [2]. High level of plasma natriuretic peptides is an important predictive factor, despite the optimal treatment. This hormone is important as a biological marker of the heart condition to assess patients who suffering from heart failure. In fact, natriuretic peptide secretion is a sign which shows heart is under pressure [5]. Natriuretic peptide secretion is a protective subject. During heavy exercise, if a high pressure be entered to an athlete or be in a desirable level of physical fitness, the pressure on heart will be increased, as a result of this mode, blood pressure is increased. The ways to prevent this issue are including the vasodilatation or increasing the volume of urine in order to reduce plasma [2].

Therefore, due to the increasing rate of patients with hypertension and since one of the effective mechanisms of blood pressure changes is related to the role of natriuretic peptide, researchers have studied sports various ways for increasing the efficiency of cardiovascular system and inhibition of blood pressure in order to find a way to increase the physiological efficiency of the human body, especially the athletes and natural production in body the and using its benefits. In recent years, the subject of the impact of physical activity on plasma is taken into consideration.

For this purpose, the impact of one anaerobic practice session on the natriuretic peptide secretion in male athletes and non-athletes has been examined in this study. The question was that whether natriuretic peptide secretion in male athletes and non-athletes can be caused by an anaerobic practice session or not?

MATERIAL AND METHODS

This study aimed to determine the effect of an anaerobic practice session on BNP serum level in healthy male athletes and non-athletes in a practical and semi-experimental form, in which the effect of an anaerobic practice session on serum BNP level was assessed in healthy male athletes and non-athletes. In this study, after familiarizing the participants with the practice protocol (RAST test after a 10 minute warm-up), blood samples were taken from both groups in order to determine the pre-test variable; then both groups have carried out a practice session and blood samples were taken again to determine the posttest variable. Finally, participants conducted a 10 minute cool-down. Statistical population of this study was all male students of Shiraz University. The statistical sample consisted of 15 athletes and 15 non-athletes who officially announced their readiness for cooperation in the research. These people were selected voluntarily and based on their availability. Athletes are people who have had at least 6 months of regular exercise (at least three sessions a week, two hours per session). Also, non-athletes are those who didn't regularly exercise. The participants were asked to complete a questionnaire that includes personal information, medical records and the level of readiness. Instruments of data collection were as follows:

Carriage scales manufactured by Beurer Company of Germany for measuring participants weight, wall meter manufactured by Seca Company of Germany to measure the height of the participants, ELISA kits, manufactured by Casobio Company of China to measure the BNP, centrifuge device to separate the serum, digital pressure gauges manufactured by Microlife company of Germany for measuring blood pressure and heart rate, 5 cc syringes, armband of alcohol bottle (70% ethanol), 10 cc test tube, microscope tubes for storing serum in them and freezing in a refrigerator. The results are analyzed in two levels of descriptive and inferential statistics. At the level of descriptive statistic, index of average will be used for calculating the central tendency and for calculating distribution the index of standard deviation and drawing tables and diagrams will be used. At the level of inferential statistic, Kolmogorov-Smirnov test will be used initially for determining the normality of data distribution and in case of confirmation of normal distribution, correlated t parametric tests will be used to compare the changes of each group before and after the practice. To compare the changes between groups, independent t and one-way analysis of covariance will be used.

The significant level of test statistics will be $P \leq 0.05$. We will use SPSS software version 16 and Excel 2013 for statistical operations.

RESULTS

Demographic characteristics of participants in this research consist of the mean and Standard deviation of age variable, weight and height of men in both groups of athletes and non-athletes are shown in Table 1.

Table 1. Demographic characteristics of participants

Variable / Statistic	Numbers	Mean ± Standard deviation	
		Athletes	Non athletes
Age(year)	15	20.00 ± 1.64	20.60 ± 1.54
Weight(Kg)	15	68.69 ± 8.23	67.88 ± 9.76
Height(cm)	15	175.06 ± 3.75	173.00 ± 4.48

Descriptive findings

Descriptive findings related to BNP in healthy male athletes showed that the BNP average pretest of athletes is more than the BNP average pretest of non athletes. Also, descriptive findings showed that the posttest average of athletes is more than the posttest average of non athletes.

Determination of normality of the data

According to the obtained results of tests, the default of the normality of measured variables distribution shows that the distribution in this study is normal, because Kolmogorov-Smirnov test is insignificant for the compatibility of sample distribution with normal distribution (P>0.05).

Examining the research hypotheses

First hypothesis: one session of anaerobic practice, significantly increased BNP in healthy male athletes.

To test this hypothesis, correlated t-test was used. According to the correlated t-test results about the effect of an anaerobic practice session on BNP increase in healthy male athletes showed that due to the amount of t which is -3.484 and the amount of p with the level of 0.002, the effect of one anaerobic practice session on BNP increase was significant in healthy male athletes. The results showed that the BNP post-test in healthy male athletes was more than the pre-test.

The second hypothesis: one anaerobic practice session leads to a significant increase in BNP in healthy non athlete men. This hypothesis was tested by correlated t-test.

According to the correlated t-test results about the effect of one anaerobic practice session on increasing BNP in healthy non-athletes men, due to the amount of t which is -5.015 and the amount of p with the level of 0.001, the effect of one anaerobic practice session on BNP increase was significant in healthy non-athlete male. The results showed that the BNP post-test in healthy non-athlete male was more than the pre-test.

The third hypothesis: baseline values of BNP in male athletes have a significant difference in comparison with non-athletes.

This hypothesis was tested through independent t-test. According to the results of the t-test about comparing the baseline values of BNP in healthy male athletes and non-athletes showed that there is no significant difference based on the amount of t which is -0.727 and the amount of p with the level of 0. 4. The results indicated that the BNP average in the pre-test of healthy male athletes is more than the amount of BNP in healthy non-athlete men.

The fourth hypothesis: changes in the level of BNP have a significant difference between athletes and non-athletes after one anaerobic practice session.

By considering the initial difference observed (in pre-test) between the studied groups, one-way analysis of covariance was used right after one anaerobic practice session between two groups of athletes and non-athletes for comparing the amounts of BNP. Test results of the effect of one anaerobic practice session on BNP in healthy male athletes and non-athletes showed that according to F-value which is 34.489 and p with the level of 0. 001, an anaerobic practice session on the level of BNP in healthy male athletes and non-athletes is statistically significant in pre-test and post-test. As the results show, the average level of BNP in healthy male athlete is more than non-athletes in the post-test.

DISCUSSION AND CONCLUSION

The purpose of this study was to determine the effect of an anaerobic practice session on BNP serum in healthy male athletes and non-athletes.

The first hypothesis was about investigating the effect of an anaerobic practice session on BNP increase in healthy male athletes. The test results of this hypothesis showed that an anaerobic practice session was effective on increasing the level of BNP in healthy male athletes. In fact, performing an anaerobic practice session can increase the BNP serum in healthy athlete men. Results in this case are in the same direction of research findings from Khalilfard [6] indicated a direct relationship between BNP and physical activity.

It looks like one anaerobic practice session increases the pressure on ventricular corridors and this pressure stimulates the secretion of BNP in male athletes. In agreement with the results of Middleton et.al, the increase in plasma levels of BNP cannot be linked only with cardiac dysfunction in athletes. Mechanical and neural-hormonal stimulations along with the stretch of Ventricular Myocytes can lead to molecular increase in both BNP and NT-pro BNP plasma, in response to the amount of ventricular expansion. Therefore, the increase in plasma levels of BNP in athletes cannot certainly indicate disease or heart dysfunction. But, the increase in BNP can be attributed to the imposed hemodynamic pressure and physiological response of heart to reduction of pressure on it [6]. Thus, increasing the level of BNP after exercise shows the increase in the pressure of left ventricular wall with the end diastolic pressure.

In the second hypothesis, the effect of an anaerobic practice session on the BNP increase was examined in healthy non-athlete men. The results of this hypothesis showed that one anaerobic practice session was effective on increasing BNP in healthy non-athlete men. In fact, conducting a session of anaerobic exercise will be able to increase the BNP serum in healthy non-athletic men. Ghanbari Niaki and Mohammady [7], in examining the effect of Rast's 4-week anaerobic exercise on hematologic changes discovered that rests anaerobic exercise can cause changes in the number of white blood cells. On the other hand, changes in size and volume of platelets may lead to an increase in the blood clotting which is caused by this form of exercise and can activate the platelets in the place of creating thrombus and stimulate the creation of thrombus. Therefore, it seems that anaerobic activities have a significant effect on the secretion of blood factors. In non-athletes, due to the increase in after-load, a high pressure within the ventricles is required to open the aortic valve. During the stage of discharge, high levels of after-load and pressure within the ventricles will lead to an increase in the pressure of heart chamber walls which is the main stimulus for cardiac hypertrophy in heart along with extra load pressure. A noticeable increase in systolic blood pressure occurs with high-intensity of isometric activity. In non-athletes, heart reacts to the compressive overload, by adding new parallel Sarkomers to existing Sarkomers; As a result, the wall thickness is increased, but the amount is less than the athlete's heart. This pathologic condition is called introverted hypertrophy. Aerobic exercise in non-athletes is associated with a marked increase in systolic and diastolic blood pressure that reacts with introverted hypertrophy.

The third hypothesis was assessed which is related to the comparison of the baseline values of BNP in athlete and non-athlete males. The results show that the mean baseline BNP in the group of athletes is more than non-athletes which may be due to the extroverted hypertrophy conducted in athlete's heart caused by the volumetric overload.

In general, sports activities reduce the risk of heart attack by creating appropriate physiological changes that these changes included the enlargement of coronary arteries, increasing the size of heart and its contraction capacity [8]. But this difference was not statistically significant; based on the principles of medical physiologic, the emergence of this event seems natural and logical. Since the purpose of the body's physiological changes in natural state is to maintain homeostasis. The prime mover of increasing the BNP release in resting position is the heart muscles twitching caused by increasing the atrial dimensions.

The findings in fourth hypothesis about the difference in the effect of implementation of an anaerobic practice session on increasing BNP in healthy male athletes and non-athletes showed that one anaerobic practice session is effective in increasing BNP and anaerobic practice is statistically efficient in increasing the BNP. Also, research results of Hejazi, Soltani and Aziz Zadeh Moghadam [9], Ghanbari Niaki and Mohammadi [7], Abdi [10], Mirghany [11] and Mortazavi [12], Khalilnajad Erie Olia [13] showed the impact of exercise on cardiac hormones. Increasing heart rate and pressure on the heart are reasons of increasing BNP in both athletes and non-athletes. In addition, the probability of the impact of practice on the performance of BNP system has also been raised through increasing the number of receptors and increasing the sensitivity toward BNP. So, athlete people may have a high sensitivity to BNP and for this reason, secretion of BNP is low in them. In general, many factors can affect on BNP secretion during exercise. Such factors include endothelin and angiotensin-2, which are not measured in this study. By stimulating the endothelin receptors, endothelin as a mediator for the secretion of BNP, plays an important physiological role by atrial cells caused by volume increase. By further entry of calcium to the atrial muscle cells, endothelin-1 and angiotensin-2 may lead to an increase in the secretion of BNP caused by atrial wall stretch and in terms of pathology it can lead to hypertrophy of heart muscle cells.

In general, results showed that sports activities lead to a balanced and appropriate process for reactions and secretion of hormones in the body; the study results showed that the effect of an anaerobic practice session increases the BNP hormone in athlete and non athlete students, that this may be due to the increase in atrial pressure, the increase in atrial secondary tension and as a result, increasing venous return and increasing related to the sport of catecholamines; but the amount of this increase is less in non-athletic individuals which may be due to the lower blood volume, weaker respiratory and muscle

pumps and subsequently, lower venous return, lower activity of catecholamines and less tension in the vessel wall. Abdi [1], in his study found that sports exercises are significantly effective in increasing the cardiac hormones in different people. The impact of exercise on metabolism and in fact, regulation of food and physical needs, makes the body to show appropriate responses and reach to a normal level of physical health.

REFERENCES

1. Braunwald E. & Kasper DL, (2005). Harrison's principles of internal medicine, 16th edition, New York: McGraw Hill
2. Alimohammadian M. (2011). The impact of anaerobic exercise program on changes in NT-pro BNP plasma and blood pressure in men, laboratory diagnosis magazine, No.96, p.38-36.
3. Holmes SJ, Espiner ea, Richards. Yandle TG, Frompton. (1993). Endocrine and hemodynamic effects of human brain natriuretic peptide in normal man the journal of clinical endocrinology & metabolism.761.7.91-96.
4. Deuster, P.a,G.P, choruses, A Luger. (1989). Hormonal and metabolic response of untrained ,moderately trained and highly trained men to three exercise intensities, metabolism.38.2.141-8
5. Cleric A, Levasi G, Marianig, (1999). Pathoysiology relevance of measuring the plasma levels of cardiac natriuretic peptide hormones in humans, harm metabras.31.487-98
6. Khalili Fard.S. Gaeini U, Nazar Ali.P. (2007). the impact of endurance sport activities on plasma levels of NT- pro-BNP and some indicators of heart damage in boating of elite males, sport science publication.
7. Ghanbari Niaki, A. Mohammadi, SH, (2009). the effect of Rest's 4-week anaerobic exercise on hematologic changes in Kickboxing men, Journal of Sports Science, fifth year, No. tenth, Fall and Winter 2009, 87-75.
8. Edgington and Edgranon, Nikbakht H. (2004). "The biology of physical activity", fourth part, Samt.132-125.
9. Hejazi M. Soltani M. Aziz Zadeh Moghaddam A, (2010). the effect of selective aerobic training on aerobic power and some physiological parameters in the blood of middle-aged men with type 2 diabetes, the journal of Medical Sciences, Mashhad Islamic Azad University. Vol.VI, No.2 (s 22), page.130-123.
10. Abdi M., (2011). the impact of aerobic exercise of cardiac rehabilitation on serum level of adiponectin hormones, Testosterone and plasma lipoproteins in men with coronary artery involvements, Master Thesis, Martyr Bahonar University of Kerman.
11. Mirghani,G, (2011). The impact of 8 weeks strength and resistance training and parallel with the secretion of Cortisol and testosterone hormones and levels of blood fats in wrestlers young man, MA thesis, Islamic Azad University, Central Tehran Branch, Faculty of Physical Education Sciences Sports.
12. Mortazavi, M.2011, The impact of moderate and severe exercises on leptin factors and growth hormone in obese Sprague-Dawley rats, master thesis, the faculty of educational sciences and psychology, Shiraz University.
13. Khalil Nezhad Erie Olia A. (2012). the effect of one period of running exercise with Hypoxia Interval on the aerobic power, Erythropoietin, hemoglobin and red blood cells of female students, Master Thesis, Institute of Physical Education and Sport Sciences, Shahid Rajaee Teacher training University.

CITATION OF THIS ARTICLE

Shahd Kiyani, Asghar Nikseresht. The Effect of one Anaerobic Practice Session on the Serum BNP Levels in Healthy Male Athletes and Non-athletes. Bull. Env. Pharmacol. Life Sci., Vol 5 [12] November 2016: 23-27