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Effect of Rhythmic Aerobic Training on Mood Status Profile and Salivary Alpha Amylase in Non-athlete Students

M Yektayar[1], M Saham[2], S Ahmadi[3] and M Khodamoradpoor[1]

[1] *Department of Sport Science, Islamic Azad University, Sanandaj Branch, Iran*
[2]*Beheshti University GC, Tehran, Iran*
[3]*Department of Physical Education Razi University, Kermanshah, Iran*

ABSTRACT

The purpose of this study is to investigate the effect of rhythmic aerobic training on mood status profile and salivary alpha amylase in male and female students. 80 non-athlete students (40 female, ages: 21 ± 2, Weight: 58 ± 8, Height: 163 ± 5 and 40 male, age s: 21 ± 2, weight: 68 ±10, Height: 176 ±5) who were physically in perfect health and had no history of disease or drug consumption, particularly steroids, were selected; based on the temperament grades of the pre-test they were randomly divided into two groups of control (20 girls and 20 boys) and training (20 girls and 20 boys). The training group did rhythmic aerobic exercises for 10 weeks; each session lasted 60 minutes including 10 minutes as warm up exercises with basic aerobic movements, 40 minutes as the main part (which started with the intensity of 140bpm and reached to 160bpm in final sessions), and 10 minutes of non-impact aerobic movements and stretching for cooling down, by which the training session ended. The control group did not participate in any training programs during the study. During 10 weeks, saliva samples were collected 5 times (10 minutes before starting physical activity, of both training and control groups, and ten minutes after cooling down of the training group, in the first, eighth, fifteenth, twenty-second and twenty-eighth sessions), and BRUMS mood questionnaire was answered by them 5 times, before the training. For statistical analysis of data, variance analysis with repeated measures and Bonferroni post-hoc test were used. Results showed that after 10 weeks of training, moods of both boys and girls improved significantly (girls, p = 0.007, F =62.50, df =19, 1; boys, p=0.008, F =62.50, df =19, 1). Also, following 10 weeks of rhythmic aerobic exercise the amount of salivary alpha-amylase depleted (girls, p =0.021, F =65.37, df =19, 1; boys, p =0.019, F =61.89, df =19, 1). Therefore, due to the specific nature of rhythmic aerobic exercise, its inclusion in people's health program is recommended.

Key words: Rhythmic Aerobic Exercise, Mood Profile, Salivary Alpha-Amylase, Non-Athlete Students

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INTRODUCTION

Rhythmic movements and in general movement are innate; and heart rate, respiratory frequency,… are the reasons which show these factors are inseparable from human life. Physical activities are one of the aspects of rhythmic movements that improve physical health and fitness. Rhythmic movements are a form of human movement which has many dimensions: physical (bodily), rhythmic, aesthetic and psychological (emotional). Rhythmic aerobic exercises are usually done in all ages and require no

special training or skills; these are among the unique properties of rhythmic aerobic exercises [1]. Due to some reasons such as aerobic nature and non-competitive environment, rhythmic aerobic exercise reduces sympathetic tone at rest [2]. A number of studies have shown that aerobic exercise enhances body composition, reduces fat percentage [3], and improves mood, general health, and social relationships [4]. One of the physiological parameters sensitive to changes in the volume and training intensity is mood. Humanities studies aim at directing people's lifestyle toward reducing negative factors of mood and improving the positive ones [5]. Numerous studies indicated the importance of mood features and manners on quality and efficiency of life; for example, features such as anxiety, depression and feeling of being well are strongly impressive on daily performance [6]. Also, nowadays using noninvasive techniques are significant to observe ethics. In this regard, saliva composition has attracted the attention of researchers. Physiology of salivary glands is based on sympathetic activity [7]. It has been shown that salivary alpha-amylase is indicative of the body's reaction to stress, both physical and mental pressure, and it's a reflection of body's adrenergic activity, so, it seems to be associated with other symptoms of stress such as cortisol and catecholamine [8, 9]. It should be noted that stress (pressure) is a multidimensional phenomenon, so it requires a multidimensional measuring method [9] thus, alpha-amylase can be considered as a non-invasive method for measuring catecholamine's activity [10,11]. Therefore, in this study we attempt to answer the question whether a period of rhythmic aerobic exercise affects the individual's mental state (mood) and its indices impact saliva or not? If yes, is this impact on change of the mood toward positive characteristics?

MATERIALS AND METHODS

Methodology

This study is quasi-experimental, and to conduct it pre, post-tests were used. Target population of the study included all non-athlete male and female students of Islamic Azad University of Sanandaj. 100 non-athlete students (50 girls and 50 boys) were randomly selected. Then the targets, sets of measures, exercise procedures, sampling days, and details of the study which were supposed to be conducted according to the study process, were explained to the subjects, and they were asked to hand in the consent form, and study and sign the written pledge, if interested to participate in the research. After that, 80 students (40 female, ages: 21 ± 2, weight: 58 ± 8, height: 163 ± 5 and 40 male, ages: 21 ± 2, weight: 68 ±10, height: 176±5) who were in total physical health and didn't have any disease history or drug consumption, particularly steroids, and who were non-athlete as well, had been selected. Eventually, the selected 80 people were divided into two groups: a control group (20 girls and 20 boys) and a training group (20 girls and 20 boys). It should be noted that the subjects were matched based on their mood scores in the pre-test and were randomly divided into blocks in their groups. within 10 weeks, saliva samples were collected 5 times (saliva samples had been collected 10 minutes before the start of physical activity in both training and control groups, and ten minutes after cooling down in training group, in the first, eighth, fifteenth, twenty-second and twenty-eighth sessions), and BRUMS mood questionnaire was completed 5 times(before the exercise).

Training Program

Training consisted of 10 weeks of rhythmic aerobic exercise. Each session lasted 60 minutes including 10 minutes of warm-up exercises with basic aerobic movements, 40 minutes as the main part (which started with the intensity of 140bpm and reached to 160bpm in the concluding sessions) and 10 minutes of cool-down exercises with non-impact aerobic movements and stretching, with which the session ended. The control group did not participate in any training programs during the study.

Mood Questionnaire

For measuring mood profile BRUMS questionnaire, including 24 questions and made by Terry et al (1999), was used. In this test only the fleeting and unstable emotional feelings are being measured. Personality characteristics or disease abnormalities are not measurable by this test. Scoring method in the test is in the way that each option has the numbers from 0 to 4, which respectively means in any way, low, average, high and very high. Questions evaluate 6 significant behavioral features such as stress - anxiety, depression - confusion, anger - hostility, fatigue - lethargy, strength - activity, confusion - chaos. Reliability of the questionnaire has been reported 0.712, using alpha Cronbach [12].

Collecting method of salivary samples and hormone assays

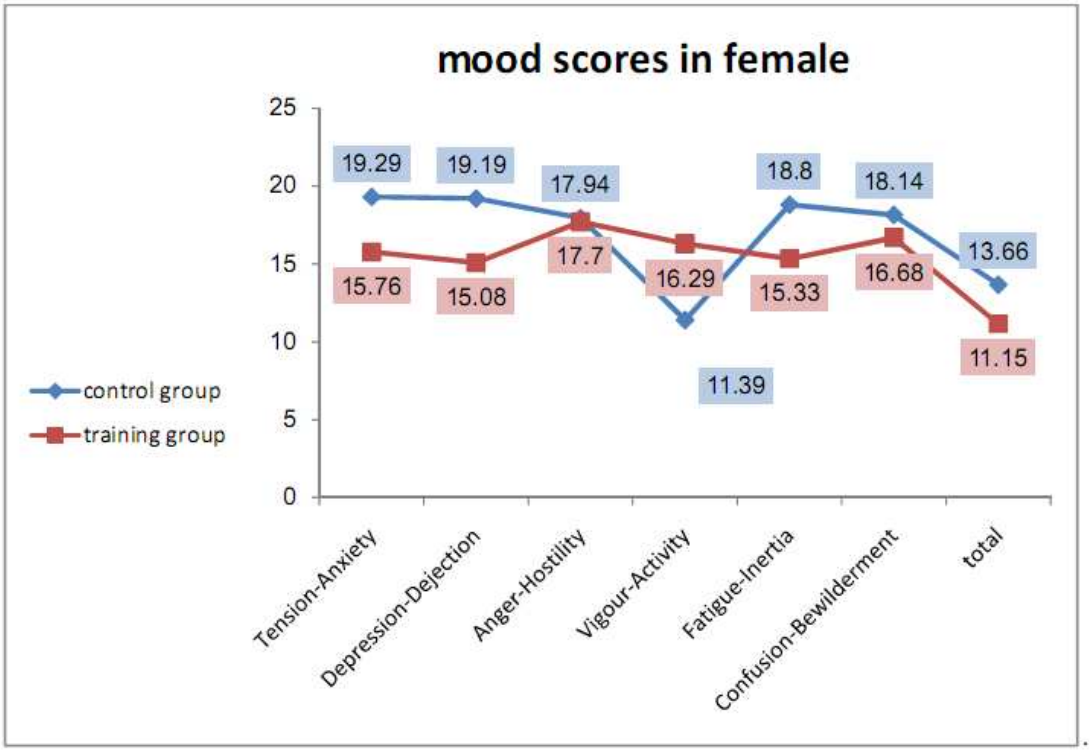
Saliva samples were taken 10 minutes before and after the exercise; subjects first wash their mouths, and in order to prevent dehydration and dry mouth they drink a cup of water (240 ml). Then, they wash their mouths with 5 cc distilled water. Following these steps, 6 ml non-stimulated saliva is poured into test tubes and samples are frozen at a temperature of - 20 ° C. After that, all the samples are defrosted at room temperature and after centrifuging, mucosa is deposited, and hormone concentrations of the liquid in the upper end will be measured.

Salivary hormone concentrations were determined using ELISA method and specific kits manufactured by Diametra Italy, with 95% confidence interval. As mentioned previously, the collected samples were frozen at -20 ° C. After the training period, on the experiment day samples were placed at room temperature to defrost, after centrifuging, mucosa was deposited so that the concentration of desired hormones could be measured from the liquid existing on the upper part of the tube. To avoid the influence of environmental factors (time, place, and experimenter), samples were tested in the same conditions. Also, the method and kits used for testing were the same for all the samples.

Statistical method

Descriptive statistics such as mean and standard deviation were used to describe data and to verify the normality of the data Kolmogrov - Smirnov test was used. Then, to test the research hypotheses, variance analysis with repeated measures was utilized. In case of observing significant differences Bonferroni post-hoc test was used. Confidence level for all the computations was considered p <0.05. All statistical operations were performed using SPSS version 19.

Fig. 1: mean scores of mood in girls

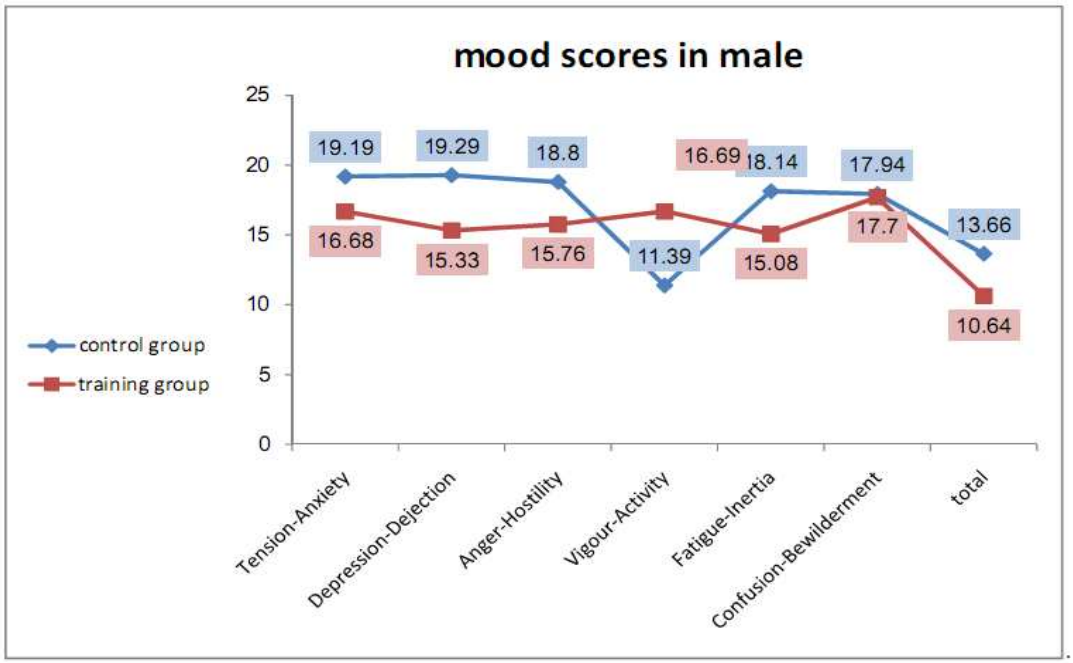


RESULTS

Results showed that after the training, overall mood improved significantly in boys and girls (girls, p = 0.007, F =62.50, df =19, 1; boys, p=0.008, F =62.50, df =19, 1). Obtained improvement in the sub-scales of stress - anxiety (girls, p =0.013, F =75. 67, df= 19 and 1), anger - hostility (boys, p =0.012, F =61. 89, df =19 and 1), depression - confusion (girls, p =0. 008, F= 65.37, df = 19 and 1; boys, p =0.009, F

=65.37, df= 19 and 1), strength - activity (girls, p =0.001, F =30.91, df = 19 and 1; boys, p =0.001,F =30.91, df =19 and 1) and fatigue - lethargy (girls, p =0.020, F =23.16, df = 19 and 1; boys , p = 0.030, F =23.16, df = 19 and 1) was observed (Fig. 1 and 2).

Fig.2: mean scores of mood in boys



Findings showed that 10 weeks of rhythmic aerobic exercise resulted in a significant reduction in the concentration of salivary alpha-amylase in both boys and girls, comparing the control group(Girls, p =00.21, F =65.37, df =19 and 1; boys, p =0.019, =61.89,df= 19and 1) (Figure 3 and 4).

Figure 3: Concentration of salivary alpha-amylase in girls

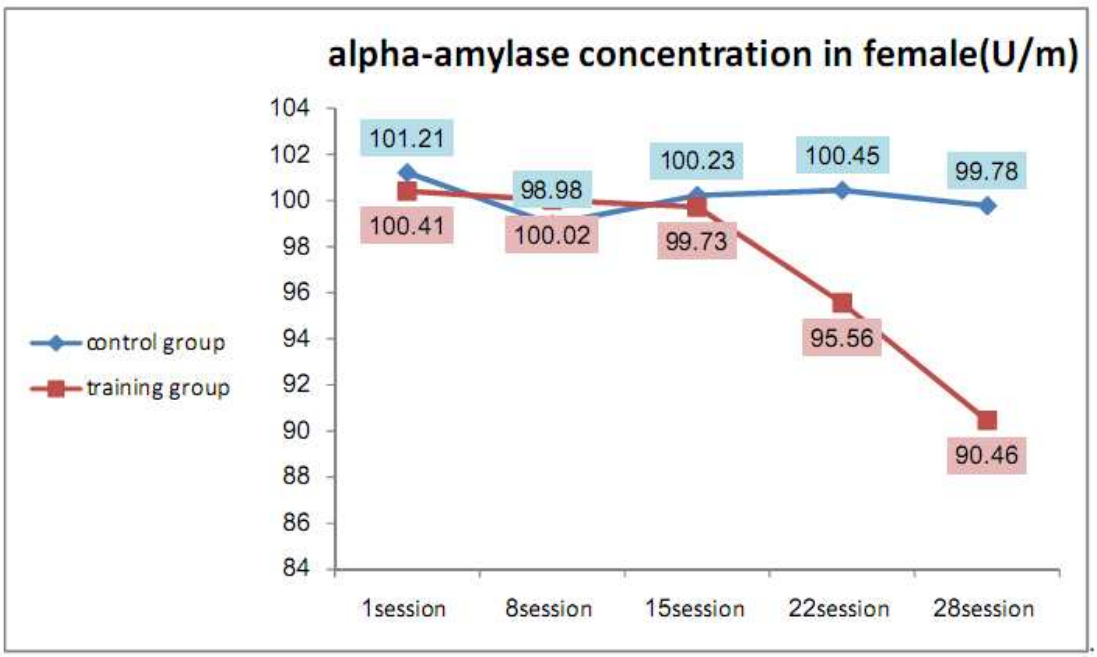
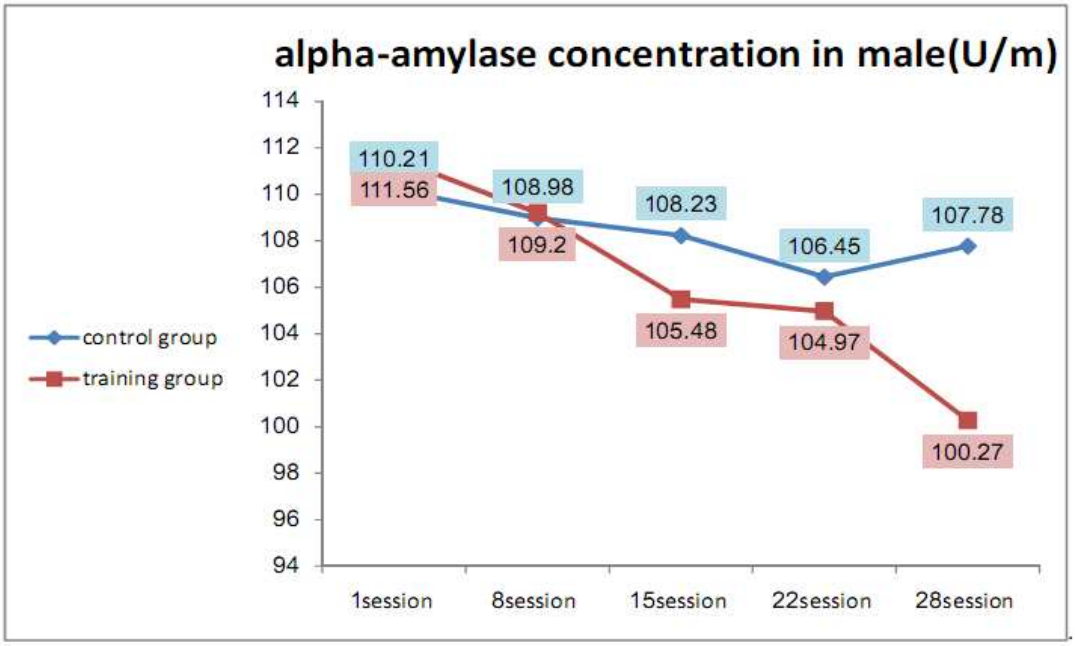


Figure 4: Concentration of salivary alpha-amylase in boys



DISCUSSION AND CONCLUSION

Since the significant and most common issue of human health (in both sexes) has long been considered, and researchers and experts in various fields have attempted to provide it, the aim of this research is to study the effect of rhythmic aerobic exercise on mood profiles and salivary alpha-amylase of girl and boy students. Results of this study suggest that 10 weeks of rhythmic aerobic exercise has improved the mood profiles of male and female subjects. It should be added that this improvement was observed in the sub-scales of stress - anxiety, depression - confusion, strength - activity and fatigue - lethargy in girls and in sub-scales of anger - hostility, depression - confusion, strength - activity and fatigue - lethargy in boys. In this regard, the above results were consistent with results of the previous studies in this area; Sakurayi and Sugiyama (2006) after a period of aerobic workout, and Mc Auley et al (2001) following a period of resistance-strength training, observed significant improvements in mood factors [13,14 In contrast, it should be noted that results of the former studies in this area are not consistent with ours. Morgan et al (1987) and Flinn et al (1997) following a 6-week period of aerobic exercise observed no significant change in the mood profile of the participants [15,16]. Martin et al (2000) and Murphy et al (1990) have shown that after a period of aerobic exercise, negative mood factors increase [17, 18].

To explain the discrepancies of the study results [17, 18] a series of points should be mentioned; first, the drop in mood profiles in these studies was because of the sudden increase in trainings, which can also be a sign of over training. It is noteworthy that the sub-scale of fatigue - lethargy increased and strength - activity decreased which show the increased training time and can lead to over training.

In other studies which reported improved mood, subjects were not professional athletes, therefore, no heavy training was done and the increased training time was based on the principle of overload and the ability of athletes. Comparing previous researches to this study, it should be noted that in the present study the training time is slowly increased based on the athletes' ability, and sufficient time to recovery was considered, because in some exercises for negative effects of exercise on mood, lack of proper compensation after the training and inadequate recovery time have been noted [19]. About the positive effects of exercise on mood profile several theories exist, such as the theory of distraction, self-efficacy theory and the theory of social interactions. Distraction hypothesis states that exercise can divert the

mind from unpleasant stimuli. According to the theory of self-efficacy, exercise improves and instills a sense of confidence and self-value; finally, because communication is the essence of sports, sense of belonging to a group and being socialized and mutual support in sports will result in improved mood characteristics [18].

Reviews of the data from a recent study showed that rhythmic aerobic exercise has led to a significant depletion in salivary alpha amylase. In their previous studies, Rohleder et al (2004) have shown that salivary alpha amylase can be demonstrative of the sympathetic nervous system's activity [20]. Sympathetic stimulation seems to increase the secretion of salivary proteins [21] and parasympathetic stimulation decreases saliva concentration, thus result in increased fluidity of saliva [22]. Several studies have reported that salivary alpha amylase level is associated with nor-epinephrine changes caused by physical stimuli (such as exercise) or psychological stimuli [23,24]. Therefore depletion of salivary alpha amylase reflects decrease in sympathetic activity, domination of parasympathetic tone and improvement of the individual's mental status [20 Our findings in this field were in line with those of Rohleder et al (2004), Chatterton et al (1996) and Walsh et al (1999) [20,23,24], not with the results of Mellanen et al (2001)Yektayar et al (2012) [25,26]; in the recent study, subjects were AIDS patients who, in terms of mucous safety and other related factors, were not in normal health and conditions, thus lack of consistent results can be attributed to such factors. As previously mentioned, findings of this study showed that as the result of rhythmic aerobic exercise, due to the specific nature of the training (non-competitive and fun environment) [27,28], alpha amylase levels decreased which indicates reduced stress [29]. These results are also confirmed by our findings on mood (decrease in stress - anxiety, depression - confusion and anger – hostility, and increase in activity - strength).

CONCLUSION

Generally, results of this study showed that rhythmic aerobic exercise improves mood in both boys' and girls' groups, and its indices in saliva such as alpha amylase are reduced. Because of the different environment and conditions such as music, lack of competition and group coordination, rhythmic aerobic exercise decreases adrenergic activity, thus catecholamine levels decrease and following that salivary alpha amylase and cortisol also decrease. Following such changes mood indices particularly depression - confusion, strength - activity and fatigue - lethargy improves. Therefore, based on the findings of this study, and as rhythmic aerobic exercise is applicable at any age and in any physical condition, incorporating these types of exercises in public health programs is highly recommended.

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