

## THE EFFECT OF AN AEROBIC TRAINING ON PERCEIVED STRESS, ANXIETY AND DEPRESSION OF NON-ATHLETE FEMALE STUDENTS

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### Abstract

The aim of this study was to study the effect of an aerobic training on perceived stress, anxiety, and depression of non-athlete female students. Statistical population of this research included all non-athlete female students of Guilan University who participated in general physical education training credits for the second semester. 40 non-athlete female students of the same age, educational level and marital status were selected by simple random sampling and divided into two groups: experiment and control (each group included 20 students). After this division, independent variable of physical activity was used for experiment group. Control group received no training. Subjects performed aerobic training 2 sessions per week, for 10 weeks. Pre- and post test measurements were used for both groups. Three questionnaires were used in this study. Spielberger state-trait Anxiety Inventory (STAI-Y) (1970) to measure anxiety including 40 questions, Beck Depression Inventory (BDI), to evaluate depression including 21 questions, and finally Perceived Stress Scale (PSS-14) (Cohen et al. 1983) including 14 questions were used. In this study, validity of the questionnaires, by using Chronbach Alpha, were determined as 0.72, 0.81 and 0.63, respectively. Independent T-tests and Multivariate analysis of Variance were used for data analysis. Results of the study showed that those students who have participated in aerobic training which was designed by researchers, had less stress, state-trait anxiety, and depression than before. This indicates the positive effect of an aerobic training period on students' anxiety, depression, and stress. This issue becomes more important when no change has been observed in control group students, who have not participated in aerobic training, regarding stress, depression, and anxiety. Considering the results of the study, it seems that one of the most useful ways to cope with stress, depression, and anxiety is participating in exercise training especially aerobic ones.

**Key words:** aerobic training, anxiety, depression, stress

### Introduction

Today, students play an important role in the future of each country and are considered as one of the most important groups in the society. This role is critical, since students are not only the main body of experts in different scientific, technological, and artistic fields in every country, but also are the management bases to build the future of their countries, and the leaders of their societies to achieve their goals. So, a healthier society needs healthier students. Psychological health is an important dimension of students' health.

This group, because of particular conditions regarding age and social situation, is under stress. Studies show that psychological diseases are becoming more epidemic among students (Heads of University Counseling Services of Royal College of Psychiatry, 2003). Factors like being far from the hometown and family, entering new environment, and being busy with heavy studies can be considered as stressful factors for the students (Byars, 2005; Cavanagh, Snape, 1997). It is found that stress can result in physical and psychological disorders, dysfunction of performance, and lack of compatibility which can reduce students' life quality (Gammon, Samuel, 2005; Ryan, Twibell, 2000). Psychological illness symptoms resulted from stress include depression and anxiety.

Studies show that there is a direct relation between anxiety, depression and stress (Byars, 2005). They are the most common emotional and psychological problems during studying in the university. Stress includes psychological pressure and distress feelings. Anxiety consists of physiological stimulations, and phobia. And depression includes a behavior accompanied with melancholy or a sense of being worthless (Lovibond, Lovibond, 1995). Statistics from Michigan University indicate that 15 percent of its students show depression symptoms (Health System, 2003). Since depression develops from early stages of life (e.g. adolescence and youth) to other stages, it is more important among students. Depression in this period of life can lead to other psychological disorders, compatibility problems and crime in higher ages (Kitamura, Hirano, Chen, Hirata, 2004). Stress factors can also affect students' cognitive and emotional actions, increase their frustration, and decrease their self-confidence, put their mental health and society's in danger and lead them to a kind of psychological, emotional, and cognitive imbalance. Thus, prevention, evaluation, diagnosis, and treatment of these disorders seem necessary. By evolutionary process and technological and scientific development, students somehow could free themselves from stressful factors.

However, this group is exposed to stressful factors in a way that it seems stress becomes an inseparable part of their lives. What students should do is to prepare themselves for coping with psychological pressures in order to reduce their stress or even remove it. If they want to achieve the best results regarding coping with stress factors, students need to know different ways to confront it. One of these ways is participating in exercise training. Research results indicated that sport and physical training not only improve social skills but, also affect students' physical-psychological health and their social compatibility (Bruce, James, Hubert, 2008). Today, physical activity is increasingly accepted as a tool for maintaining and increasing psychological health. Studies showed that participating in sport activities can improve indices of life quality, reduce mental disorders, depression, and fatigue, and promote emotional health. Thus, it plays an important role in peoples' vitality (World Health Organization, 1995). Physical activity and exercise training, in different societies all over the world with their especial requirements, are accepted as inevitable needs which are used in different ways. One of them in order to get physical fitness is aerobic training. Graft & Landers (2000) and Moor & Blumenthal (1998) in their studies indicated that aerobic training was a useful and cost effective tool in reducing low to medium depression and could prevent it, move away fatigue and psychological pressures, and make a person happy. Blehar & Oren (1995) findings show that depression degree in women is two times more than men, and women are more vulnerable to stress and psychological pressures than men. They also conclude that different exercise training play an important role in reducing depression among women. Results from Sarp and Hilal (2008) studies, show that female students are more susceptible to psychological disorders than male students. Chu et al. (2009), suggest that intense and easy aerobic training decrease depression in female non-athletes. Azar et al. (2008) indicate that participating in physical training even for a short period can have positive impact on adult women depression. Rothern et al. (2010) by reviewing the relation between physical activity and depression among east London adolescent boys and girls show that participating in sport activities can reduce depression among adolescents. Kawachi & Berkman (2003) and Boyette (2006) conclude that participating in physical activities can reduce anxiety and depression and accelerate socialization. Results from Hegbom et al. (2007) indicate that more physical activities lead to reduction in stressful factors, psychological disorders, depression symptoms, and increase in social interactions and physical-psychological health among elderly. In a research Salvatore et al. (2009) observed that those who participated in physical activities and recreational sports experience had less stress and mental pressures than others. Based on results from Noakes (2008) study and Mellalieu, Neil, Hanton, Fletcher. (2009) it is found that those who do physical activity face reduction in stress and

anxiety. Reviewing 64 studies, from 1988 to 2004, suggests that physical activities are used as a strategy in order to cope with stress. Regarding the relatively high level of anxiety, depression, and stress in current social situation specially among female students and the impacts of destructive psychological pressures on motivation, educational performance, self-confidence, and their health. Also the role of physical training in reducing students stress factors, studying the effect of an aerobic training period on perceived stress, anxiety, and depression of non-athlete female students seems necessary. Moreover, past researches, study the impact of different ways of physical activity on peoples psychological pressures. Regarding the availability of aerobic training and their low cost, it seems that students, who are financially family dependent, choose them over other activities as Graft & Landers (2000), and Moor & Blumenthal (1998) report that since aerobic training are cost effective and can be performed easily, they have remarkable impact in reducing psychological pressures. They also reported that low to medium aerobic training has more effectiveness. Aerobic training such as running can be done almost everywhere; it plays a very important role in cardio respiratory fitness of those who have no physical experience, and it can help improving their psychological conditions. Besides, aerobic exercises in the appendix, which include various physical exercises, prioritize non-athletes. These exercises need no tools and equipment, so they can be the most possible exercise method in order to observe positive impacts of the pre-hypothesis.

## Methods

Semi-experimental method is used for this study, regarding its goals, which is conducted as pre-test and post-test with control group. In this method subjects are randomly substituted into groups and experiment group is exposed to independent variable (aerobic training) but, control group is received no interference. Statistical population of this study included all non-athlete female students of Guilan University who had selected (1) and (2) general physical education training credits for the second semester. 40 non-athlete female students of the same age, educational level and marital status were selected by simple random sampling and divided into two groups: experiment and control (each group included 20 students). After this division, independent variable of physical training was used for experiment group. Control group received no training. Physical training was performed 2 sessions per week, for 10 weeks by 48-hour interval between each session. Pre-test was used for both groups in the first session, and after physical training period with experiment group, post-test was used for these two groups.

### *Interference method*

Each session, physical training lasted 40 to 50 minutes and included 15 minutes for warm up (stretching and exercise), and 20 to 30 minutes of aerobic training like running with 60 to 80% maximum heart rate (which calculated by the

formula:  $220 - \text{age}$ ). The first two weeks maximum heart rate was 60% ( $HR_{\max}$ ), second two weeks 65%  $HR_{\max}$ , third two weeks 70%  $HR_{\max}$ , fourth two weeks 75%  $HR_{\max}$ , and last two weeks it was 80%  $HR_{\max}$  and 5 minutes allocate to cooling down (static stretching moves). Heart rates were controlled by a pulse meter (polar model, made by Finland). Time was recorded by a Citizen chronometer (made by Germany). Subjects were told to avoid extreme physical activities but those assigned and keep their usual diet.

#### Instruments

Spielberger state- trait Anxiety Inventory (STAI-Y) was used for this study. This scale was presented by Spielberger (1970) in order to evaluate anxiety and was revised in 1983. It includes 40 points which 20 of them evaluate the state of anxiety and the other 20 estimate trait of anxiety. Each point consists of 4 choices which are scored based on Lickert from 1 to 4. Spielberger (1983) reported the correlation of the questionnaire 0.79 to 0.83 with Taylors manifest Anxiety Scale (TMAS). Content validity of STAI has been confirmed by previous studies (Hamdyhm and M. Mashhoodi, 1998). In this study, validity of the scale was 0.73 for state of anxiety and 0.69 for trait of anxiety by using Chronbach Alpha. Beck Depression Inventory (BDI): This questionnaire is one of the most suitable tools for evaluating depression which includes 21 points and measures physical, behavioral, and cognitive symptoms of depression. Each point includes 4 choices which are scored 0 to 3 based on Lickert. Meta- analysis results about BDI suggest that its internal concordance coefficient is between 0.73 to 0.93 (Beck et al., reported from marl Gras, 2003). Content validity of BDI has been extensively tested and confirmed by previous studies (Saburi, Mahyar, Gharib, 1998). Dobson and Mohammadkhaani, calculated a coefficient of 0.92 for outpatients, 0.93 for students, and retest coefficient of 0.93 with one-week interval. Kuhner et al. (2007) reported good reliability and validity of BDI in clinical and nonclinical samples. In this research, validity was 0.81 by using Chronbach Alpha. Perceived Stress Scale (PSS-14): This scale is presented by Cohen, Kamarck & Mermelstein (1983) and is used to measure general stress within last month. It, also evaluates thoughts and feelings about stressful events, controlling, overcoming, coping with psychological pressures and experienced stresses. This scale includes 14 points which is scored 0 to 4 based on Lickert. Cohen et al. (1983) reported its validity from 0.84 to 0.86 based on Chronbach Alpha. They felt that pre validity and reliability by retest method was suitable for PSS-14. Andreou et al. (2011) found satisfactory Chronbach alpha values (0.82 for the full scale) for PSS-14. In this research, scale's validity was 0.63 using Chronbach Alpha. For data analysis, frequency, for showing demographical characteristics, mean and standard deviation, for comparing mean of studied variables in pre-test and post-test of two groups, independent t-test and Multivariate analysis of Variance were used.

## Results

Subject of this study were between 19 to 26 years old. The average age of experiment group (mean=21.5, SD=2.92) was equal to that of control group (mean=21.85, SD=2.18). All of the subjects were single. According to table 4, state and trait anxiety, depression, and perceived stress scores in post-test are less comparing to that of post-test. In control group, scores of post-test showed no meaningful difference comparing to pre-test.

Table 4. Descriptive statistics of anxiety, depression, and perceived stress scores in experiment and control groups

index	Test	Experimental group		Control group	
		average	Standard deviation	average	Standard deviation
State anxiety	pretest	46.05	5.75	47.20	4.88
	posttest	28.15	3.26	47.50	9.56
Trait anxiety	Pretest	45.65	5.54	45.70	4.14
	posttest	29.45	3.01	47.15	8.27
Depression	Pretest	15.35	3.06	16.25	4.60
	Posttest	9.60	2.10	17.35	4.27
Perceived stress	Pretest	26.45	5.07	24.65	5.40
	Posttest	9.40	3.05	25.95	4.68

According to table 5, calculated (t) was not significant to study the comparison between experiment and control groups' mean scores in trait and state of anxiety, depression, and perceived stress. In other words, these variables in experiment group are statistically similar to that of control group before interference (aerobic training).

Table 5. Results of independent t-test to compare mean of control and experiment groups' pre-test scores in state and trait anxiety, depression, and perceived stress

index	Levenes Test for Equality of Variances		t	df	Sig
	F	Sig			
State anxiety	0.66	0.42	0.68	38	0.47
Trait anxiety	1.50	0.22	0.03	38	0.97
Depression	2.73	0.10	0.72	38	0.39
Perceived stress	1.09	0.30	1.08	38	0.28

Multivariate analysis of Variance test was used in order to compare post-test mean scores of control and experiment groups in state and trait of anxiety, depression and perceived stress. Based on results from table 6, significance of F showed that after modifying pre-test means, there was a significant difference between mean of experiment group and that of control group in post-test. In other words, aerobic training positively affected state and trait of anxiety, depression and perceived stress of experiment group.

Table 6. Results of Multivariate analysis of Variance test to compare mean of post-test scores of experiment and control group in state and trait of anxiety, depression and perceived stress

Partial Eta Squared	sig	f	Mean Square	df	Sum of Squares	Source
0.67	0.001	69.09	3607.53	1	3607.53	State anxiety
0.66	0.001	66.72	2777.79	1	2777.79	Trait anxiety
0.64	0.001	62.81	639.70	1	639.70	Depression
0.88	0.001	266.09	2672.81	1	2672.81	Perceived stress

## Discussion and conclusion

Analysis of the study results showed that scores of state and trait of anxiety, depression, and perceived stress in post-test in experiment group were less than that of pre-test. In control group there was no significant difference between scores of post-test and pre-test. It means that students, who have participated in aerobic training which was designed by researchers, had less stress, state-trait anxiety, and depression than before. This indicated the positive effect of an aerobic training period on students' anxiety, depression, and stress. This issue becomes more important when no change had been observed in control group students, who had not participated in aerobic training, regarding stress, depression, and anxiety. More analysis illustrate that finally after 10 weeks (training period) students of experiment group who did aerobic training, experience considerably less anxiety, depression, and stress, which is even less than that of students of control group in the same period. Studying 64 researches from 1988 to 2004 show that physical activity was used as a strategy in order to cope with stress (Mellalieu, Neil, Hanton, Fletcher, 2009). Various studies used different physical activities as a strategy to cope with stress, anxiety, and depression. This study tried to use aerobic training which not only has positive psychological outcomes, but also promotes people's cardio-respiratory health. Aerobic training also needs no special skills and it is cost effective. Chu et al. (2009) also studied two kinds of aerobic exercise with intensity of 45% to 55% and 65% to 75% maximum heart rate. They showed that aerobic exercise in both situations decreased subjects' depression pressure, and there was no

significant correlation between the intensity of aerobic exercises and changes in women depression. It has been shown that the type of exercise and its intensity affected depression decrease. He designed two kinds of exercise with 60-minute and 90-minute time period for the subjects which finally reported a meaningful difference between the effect of these two exercises and depression decrease degree. Blehar & Oren (1997) find that depression in women is two times more than men, and women are more exposed to stress and psychological pressures, and different physical activities play an important role in facilitating and decreasing depression in women. Azar et al. (2008), in a study about women, report that physical training is an important factor to decrease their anxiety and stress. Graft & Landers (2000), Moor & Blumenthal. (1998), Rathon et al. (2010), Kawachi & Berkman (2000), Boyette et al. (2006), Hegbom et al. (2007), Lindstrom et al. (2003), Salvatore et al. (2008), Noakes (2008), and Mellalieu, Neil, Hanton, Fletcher. (2009) show that physical activities are suitable and cost effective means to decrease anxiety and depression and can prevent it. They can remove fatigue and psychological pressures from people and reveal their happiness and vitality. According the results of this study and those studies which are conducted before by the same researchers, it appears that sport and physical activity, at least, can help considerably decreasing daily stress, anxiety, and depression of people specially among female students and can lead to improve their psychological health and vitality. Apparently, the intensity and type of designed exercises and training in various studies have different impacts on people's psychological health concerning different subjects. It also seems that designed aerobic training in this study has considerable effectiveness concerning its nature and conditions of subjects in order to decrease anxiety, depression, and stress among female students. Since students have several difficulties during studying and financial problems are among them, and regarding participating in exercise training especially aerobic ones have low costs, and based on the results of this study, it seems that one of the most effective ways to cope with anxiety, depression, and stress is participating in exercise training especially aerobic ones.

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## UČINCI AEROBNOG TRENINGA NA OPAŽENI STRES, ANKSIOZNOST I DEPRESIJU KOD DJEVOJAKA NESPORTAŠA

### Sažetak

*Cilj ovog rada bio je proučiti učinak aerobnog treninga na opaženi stres, tjeskobu i depresiju djevojaka nesportaša. Statistički, populacija ovog istraživanja uključuje sve nesportaše studentice Guilan Sveučilišta koje su sudjelovale u općem tjelesnom odgoju za drugi semestar. Ukupno 40 nesportaša studentica iste dobi, razine obrazovanja i bračni status odabrano je jednostavnim slučajnim uzorkovanjem i podijeljeno u dvije skupine: eksperimentalna i kontrolna (svaka grupa je imala po 20 entiteta). Nakon ove podjele, nezavisna varijabla fizičke aktivnosti korištena je kod eksperimentalne grupe. Kontrolna grupa nije dobila nikakvu obuku. Ispitanice eksp. grupe su vježbale su aerobni trening dva puta tjedno, u ukupnom trajanju od 10 tjedana. Prije i poslije ispitivanja, obje skupine su izmjerene upitnikom. Tri upitnika su korištena u ovoj studiji. Spielberger stait-trate Anxiety inventara (STAI-Y) (1970) za mjerenje anksioznosti, sa 40 pitanja, zatim Beck Depression Inventory (BDI), za procjenu depresije, sa 21 pitanjem, i konačno Perceived Stress Scale (PSS-14) (Cohen i sur. 1983), sa 14 pitanja za procjenu stresa. U ovoj studiji, valjanosti upitnika, pomoću Chronbach Alpha, utvrđene su kao 0,72, 0,81 i 0,63, respektivno. Nezavisni T-testovi i Multivarijatna analiza varijance su korišteni za analizu podataka. Rezultati studije su pokazali da su oni studenti koji su sudjelovali u aerobnom treningu dizajniranom od strane istraživača, imali manje stresa, stanja anksioznosti i depresije nego prije eksperimenta. To ukazuje na pozitivan učinak aerobnog treninga u tretiranom razdoblju na studente. Ovo pitanje postaje još važnije kada nema uočenih promjena u kontrolnoj skupini studenata, koji nisu sudjelovali u aerobnom treningu, s obzirom na stres, depresiju i anksioznost. Obzirom na rezultate istraživanja, čini se da je jedan od najkorisnijih načina da se današnji čovjek (žena) nosi sa stresom, depresijom i tjeskobom upravo sudjelovanje u vježbanju naročito u aerobnom.*

**Ključne riječi:** aerobni trening, anksioznost, depresija, stres

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