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The Effect of Aerobic and Anaerobic Fitness on Separation Anxiety, Generalized Anxiety, Social Phobia, Obsessive–Compulsive Behaviors, Panic and Agoraphobia and Physical Injury Fears in Children with Tic Disorder

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Abstract

Aims: Tics are known to have negative effects on psychosocial performance in children and also for their family. Exercises are appropriate strategies for the prevention and management of chronic diseases. This study evaluates the effect of aerobic and anaerobic fitness on psychological function in children with tic disorder, and evaluation of their effects by questionnaires completed by their parents.

Materials & Methods: A randomized controlled trial was carried out for 12 weeks in children's with motor tics. Children were randomly assigned into three groups: aerobic, anaerobic and Control (without exercise). To investigate the tic severity, Yale global tic severity scale was used. Parents completed Spence Children's Anxiety Scale Child and Parent Versions in pre-test (pre-interventions) and post-test (after 12 week exercises). This study assessed the effects of aerobic, and anaerobic fitness, the effect of time (pre-test & post-test), and their interaction on psychological function.

Findings: The results showed that aerobic and anaerobic fitness significantly decreased Separation Anxiety, Panic and Agoraphobia, Physical Injury Fears, Social Phobia, Obsessive-Compulsive and Generalized Anxiety ($P<0.05$) compared to control group.

Conclusion: In sum, aerobic and anaerobic fitness could alleviate psychological disorders in children with tic syndrome. It can be suggested parents of children with tic to force their children for performing aerobic and anaerobic fitness in order to alleviation of disorders.

Keywords: Aerobic Fitness; Anaerobic Fitness; Physical Injury Fears; Social Phobia; Obsessive-Compulsive; Tic syndrome

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Introduction

Tourette syndrome (TS) is known as a neurodevelopmental disorder in patients with motor and vocal tics for at least one year [1]. Tics are not serious disorders, but these are transient disorders in childhood that influence development in child's [2]. Tics are short and insignificant, such as blinking, grimacing and head, nose twitching, mouth, and shoulder movements [1]. Tics are short, but these influence psychological performance in children, and members of family [2]. Children with tic disorders are faced with neuropsychiatric conditions, such as attention deficit hyperactivity disorder and obsessive compulsive [3]. It was reported 85% anxiety disorders in children with tic disorders [3]. Parents and childrens commonly report distressed behaviors associated with faulted daily function and anxiety disorders [4]. Different strategies are used for decreasing psychological symptoms in patients with tic syndrome, such as drugs, physical activity, etc. The application of drughs has been faced with limitiations, due to their side effects [2]. Researchers are interested to use physical activity for alleivating psychological disorders. It was reported using exercises for alleivation of diseases [5].

Physical activity is an appropriate strategy for the alleivation of adverse effects of disorders. Exercise is considered as first strategy for the prevention and management of disorders. Performing a regular exercise causes physiological changes and adaptations in the human body by affecting on hypothalamicpituitary-adrenal (HPA) axis reactivity [6, 7]. The region has an important role for improving adaptive responses to physical and psychological stressors [8]. It was reported depressive and anxiety signs in patients with faulted in the HPA [9]. Exercises are divided into aerobic and anaerobic exercises [10]. Aerobic and anaerobic exercises have different effects on physiology of the body. It was reported that type of exercise can have an appropriate on mental indices [11]. Other studies did not found positive effects of physical activities on mental indices [12]. It was reported efficiency of anaerobic exercises for decreasing anxiety [13].

Seemingly, aerobic and anaerobic fitness can have positive effects psychological function in children with motor tic. Psychological disorders are a part of tic syndrome that are not considered by scientific community, but these influence children. To the best of our knowledge, any study has not been conducted to evaluate the effect of aerobic and anaerobic fitness on psychologial function in children with tic disorder. This study was thus conducted to evaluate the effect of effect of the aerobic and anaerobic fitness on separation anxiety, generalized anxiety, social phobia, obsessive–compulsive behaviors, panic and agoraphobia, and physical injury fears in children with tic disorder.

Materials and Methods

Ethics Statement

All the used procedures were in agreement with local Ethical Committee (Physical Education Review Board of Islamic Azad University, Kermanshah-Iran) (No premission, IAUKI, 13401). We collected consents from parents all the subjects before participation of their children. Not only children, but also their parents completed consents.

Study procedure

This randomized controlled trial was conducted for 12 weeks in childrens with motor tics. Forty-five girl children were randomly assigned into 3 groups including 1) Aerobic group that children exercised aerobic fitness for 12 weeks, 2) Anaerobic group that children exercised anaerobic exercises for 12 weeks, and 3) Control group that children did not receive any training.

Participants

Forty-five children ranging from 9 to 11 years of age (M =10.78 years, SD=1.24) were studied in this study and completed evaluations at post-test. Flowchart of the study is illustrated in Figure 1. Body weight (in shorts and t-shirt) and height (without shoes) were investigated by an electronic scale and converted to body mass index (BMI). Children were randomly selected from local elementary schools in the Kermanshah Province, West region-Iran. The inclusion criteria were as follows; 1) Consent of children for participation in the study, 2) Children aged between 10-12 years of age, 3) Children had no medical condition that would affect study results or limit physical activity, 4) Children with tic severity >2 and 5) Children were not taking medication that would affect study results (e.g. antipsychotics). Exclusion criteria included: 1) Children did not have tendency for participation in this study, 2) Children with tic severity <2, 3) Consumption of drugs that would affect study results or limit physical activity, 4) The use of antipsychotics and 5) Non-participating in exercises for at least 2 meetings.

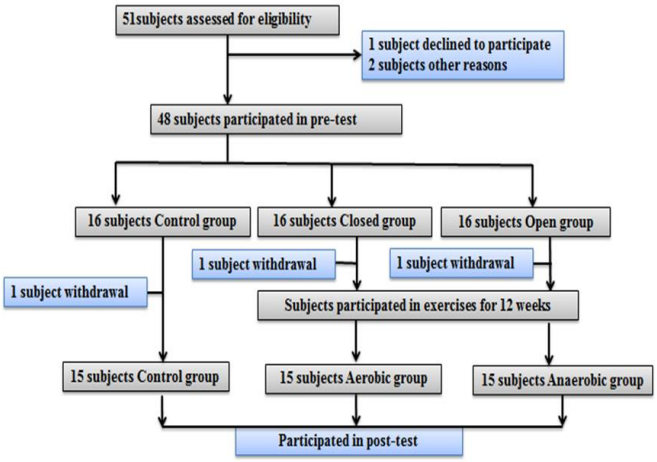

Figure 1) Flowchart of the study

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Yale global tic severity scale

The Yale global tic severity scale is a clinician-rated measure for tic severity over the last 7–10 days that has a stable factor structure and excellent psychometric properties. The motor and tics are rated at a 0–5 scale across 5 dimensions: number, frequency, intensity, complexity, and interference [14].

Exercise intervention

The exercise sessions were carried out after school during consecutive sessions. Children were transported by bus to a training place at the Kermanshah city. Instructors were including master's level physical educator, bachelor's level exercise scientists, and other trained research staff who had at least some college education. In this study, we emphasized on enjoyment and safety, but no competition. The program of aerobic training was designed by a cycle ergometer, triplicate a week, during 12 weeks and for an initial period of 40 minutes [16]. The anaerobic training was performed using the method of "Interspaced Training [15]. In this study, parents completed Spence Children's Anxiety Scale Child and Parent Versions (SCAS-C; Spence,1998) in pre-test (pre-interventions) and post-test (after 12 week exercises). The questionnaire included 38 items rated on a 4-point scale (0 to 3; never to always), and the SCAS-C includes six additional positive filler items. The SCAS-C/P comprise six subscales addressing Separation Anxiety (six items), Generalized Anxiety (six items), Social Phobia (six items), Obsessive–Compulsive Behaviors (six items), Panic and Agoraphobia (nine items), and Physical Injury Fears (five items).

Statistical Analysis

The present study was conducted in a 2×3 factorial arrangement with the effect of time (pre-test & post-test) and exercises (Control, Aerobic & Anaerobic) and their interaction. The data were reported as mean±SD, and analyzed for the main effects of time and exercise and the interactions between time and exercise. The data were analyzed by SPSS software (version 23.0). Comparisons between groups were conducted by Sceffe test and paired-tests were conducted by T-test. Kolmogorov-Smirnov test was used to test the normality.

Findings

Descriptive characteristics

The data for descriptive characteristics are shown in Table 1. There results did not show significant differences between groups (P>0.05). It means that all the subjects had similar conditions for age, weight, height, and BMI.

Table 1) The subjects characteristics (Mean±SD)

	Control	Aerobic	Anaerobic	P-value
Age (Year)	10.56±0.848	11.23±0.848	10.57±0.834	0.905
Weight (Kg)	33.12±1.35	32.21±1.91	34.51±2.12	0.823
Height (m)	1.29±0.10	1.32±0.21	1.27±0.11	0.821
BMI (Kg/m2)	19.95±2.26	18.51±2.20	21.43±2.11	0.356

Yale global tic severity scale

Our findings for five dimensions in the different groups are presented in Table 2. The results did not show significant differences between groups (P>0.05).

Table 2) Distribution of yale global tic severity scale scores across participants (Mean±SD).

	Control	Aerobic	Anaerobic	P-value
Number	3.32±0.41	3.57±0.71	3.61±0.42	0.783
Frequency	4.21±0.57	4.10±0.57	4.32±0.59	0.571
Intensity	3.12±0.51	3.09±0.52	3.01±0.58	0.711
Complexity	2.62±0.72	2.57±0.62	2.42±0.51	0.712
Interference	2.57±0.49	2.51±0.43	2.39±0.41	0.523

Normality

The results for normality distribution for all the parameters in pre-test, and post-test are shown in Table 3. The results showed that values are higher than 0.05 that show normality.

Table 3) The results for normality status

	Pre-test			Post-test		
Variables	Z	P-value	Status	Z	P-value	Status
Separation Anxiety	1.282	0.081	Normal	1.083	0.079	Normal
Generalized Anxiety	1.115	0.212	Normal	0.911	0.314	Normal
Social Phobia	1.241	0.059	Normal	0.859	0.341	Normal
Obsessive–Compulsive	1.029	0.239	Normal	1.002	0.091	Normal
Panic and Agoraphobia	1.222	0.152	Normal	1.226	0.071	Normal
Physical Injury Fears	0.751	0.326	Normal	1.112	0.099	Normal

The effect of areobic and anaerobic fitness on Separation Anxiety

The effects of aerobic, and anaerobic fitness on Separation Anxiety are presented in Table 4. The results for the effect of aerobic and anaerobic fitness on Separation Anxiety were as follows: For the effect of time [F (1, 44) = 7.10, P=0.0009], fitness [F (2, 44)= 5.41, P=0.001] and time × fitness interaction [F(1,44)= 6.12, P=0.001]. Scheffe test showed significant difference between groups in post-test (P=0.0001). The results showed that aerobic and anaerobic fitness decreased separation anxiety in post-test (Figure 2).

Table 4) The effect of aerobic, and anaerobic fitness on Separation Anxiety in pre and post-Test (Mean±SD).

Groups	Pre-test	Post-test	T-test
Control	2.61±0.59	2.65±0.44	0.731
Aerobic	2.64±0.48	2.11±0.47	0.029
Anaerobic	2.65±0.39	2.08±0.48	0.036
Scheffe	0.912	0.0001	
		P-values	
Time	F (1, 44)=7.10, P=0.0009		
Exercise	F (2, 44)=5.41, P=0.001		
Time* Exercise	F (1, 44)=6.12, P=0.001		

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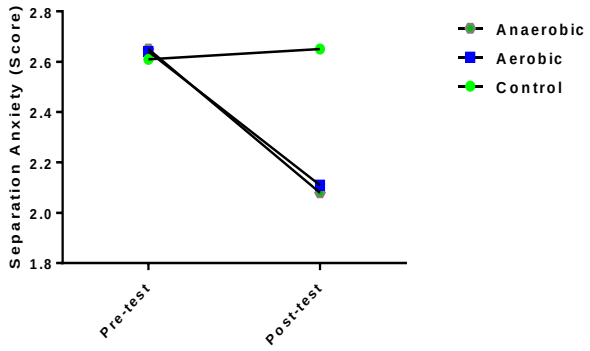

Figure 2) Effect of aerobic, and anaerobic fitness on Separation Anxiety in pre and post-Test

The effect of areobic and anaerobic fitness on Panic and Agoraphobia

Our findings for the effect of aerobic, and anaerobic fitness on Panic and Agoraphobia are shown in Table 5. The results for the effect of aerobic and anaerobic fitness on Panic and Agoraphobia were; the effect of time [F (1, 44) = 7.08, P=0.0001], fitness [F (2, 44)= 7.22, P=0.0001] and time × fitness interaction [F(1,44)= 7.67, P=0.0001]. There was significant response for Scheffe test in post-test (P=0.0001). The results showed that aerobic, and anaerobic fitness reduced Panic and Agoraphobia (Figure 3).

Table 5) Effect of fitness on Panic and Agoraphobia in pre and post-Test

Groups	Pre-test	Post-test	T-test
Control	2.85±0.53	2.83±0.69	0.912
Aerobic	2.91±0.72	2.13±0.21	0.0001
Anaerobic	2.79±0.50	2.05±0.24	0.0001
Scheffe	0.812	0.0001	
		P-values	
Time	F (1, 44)=7.08, P=0.0001		
Exercise	F (2, 44)=7.22, P=0.0001		
Time* Exercise	F (1, 44)=7.67, P=0.0001		

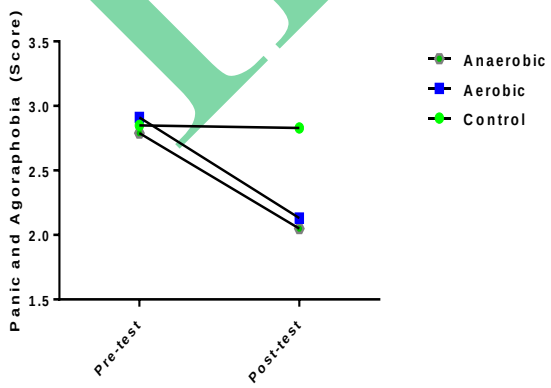

Figure 3) The effect of aerobic, and anaerobic fitness on Panic and Agoraphobia in pre and post-Test

The effect of areobic and anaerobic fitness on Physical Injury Fears

The results for the effects of aerobic and anaerobic fitness on Physical Injury Fears are shown in Table 6.

The results for the effect of aerobic and anaerobic fitness on Physical Injury Fears were as follows: For the effect of time [F (1, 44) = 31.48, P=0.0001], fitness [F (2, 44)= 15.48, P=0.0001] and time × fitness interaction [F(1,44)= 16.39, P=0.0001]. Scheffe test showed significant difference between groups in post-test (P=0.0001). The results showed that aerobic and anaerobic fitness decreased Physical Injury Fears (Figure 4).

Table 6) Effect of skill exercises on Physical Injury Fears in pre and post-Test

Groups	Pre-test	Post-test	T-test
Control	2.89±0.51	2.78±0.50	0.956
Aerobic	2.75±0.51	1.32±0.44	0.0001
Anaerobic	2.74±0.31	1.42±0.44	0.0001
Scheffe	0.923	0.00001	
		P-values	
Time	F (1, 44)=31.48, P=0.0001		
Exercise	F (2, 44)=15.48, P=0.0001		
Time* Exercise	F (1, 44)=16.39, P=0.0001		

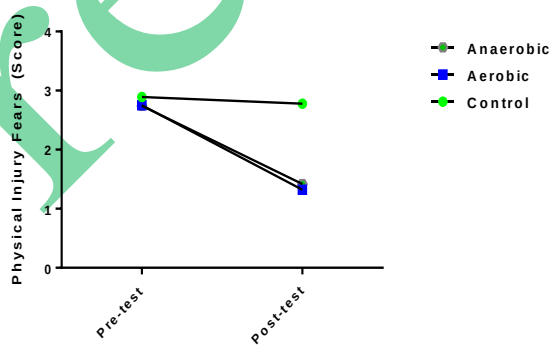

Figure 4) The effect of aerobic, and anaerobic fitness on Physical Injury Fears in pre and post-Test

The effect of areobic and anaerobic fitness on Generalized Anxiety

The results for the effect of aerobic and anaerobic fitness on Generalized Anxiety are presented in Table 7. The results for the effect of aerobic and anaerobic fitness on Generalized Anxiety were including: The effect of time [F (1, 44) = 14.20, P=0.0001], fitness [F (2, 44)= 21.18, P=0.0001] and time × fitness interaction [F(1,44)= 15.49, P=0.0001]. There was significant response for Scheffe test in post-test (P=0.001).

The effect of areobic and anaerobic fitness on Social Phobia

The results for the effect of aerobic and anaerobic fitness on Social Phobia are shown in Table 8. The results for the effect of aerobic and anaerobic fitness on Social Phobia were including: The effect of time [F (1, 44) = 19.60, P=0.0001], fitness [F (2, 44)= 21.45, P=0.0001] and time × fitness interaction [F (1,44)= 23.12, P=0.0001]. It was observed significant responses for Scheffe test in post-test (P=0.0001).

Table 7) The effects of skill exercises on Generalized Anxiety in pre and post-Test

Groups	Pre-test	Post-test	T-test
Control	2.83±0.21	2.75±0.51	0.759
Aerobic	2.79±0.34	2.05±0.21	0.001
Anaerobic	2.71±0.35	2.08±0.22	0.001
Scheffe	0.938	0.001	
		P-values	
Time	F (1, 44)=14.20, P=0.0001		
Exercise	F (2, 44)=21.18, P=0.0001		
Time* Exercise	F (1, 44)=15.49, P=0.0001		

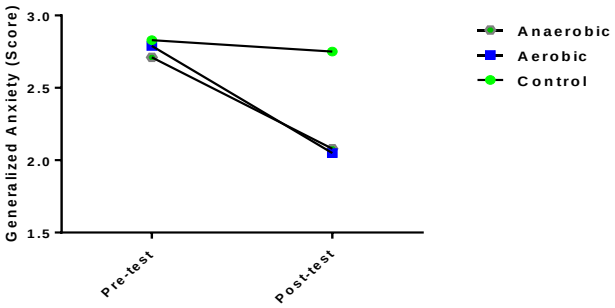

Figure 5) The effect of aerobic, and anaerobic fitness on Generalized Anxiety in pre and post-Test

Table 8) The effects of skill exercises on aerobic, and anaerobic fitness on Social Phobia in pre and post-Test

Groups	Pre-test	Post-test	T-test
Control	2.91±0.12	2.75±0.51	0.759
Aerobic	2.82±0.25	2.05±0.21	0.001
Anaerobic	2.85±0.25	2.08±0.22	0.001
Scheffe	0.901	0.0001	
		P-values	
Time	F (1, 44)=19.60, P=0.0001		
Exercise	F (2, 44)=21.45, P=0.0001		
Time* Exercise	F (1, 44)=23.12, P=0.0001		

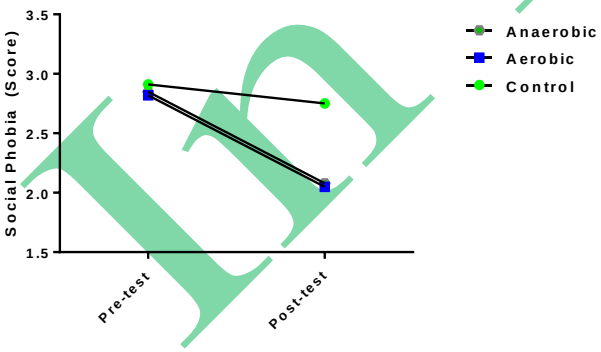

Figure 6) The effect of aerobic, and anaerobic fitness on Social Phobia in pre and post-Test

The effect of areobic and anaerobic fitness on Obsessive–Compulsive

The results for the effect of aerobic and anaerobic fitness on Obsessive–Compulsive are shown in Table 9. The results for the effect of aerobic and anaerobic fitness on Social Phobia were including: The effect of time [F (1, 44) = 21.20, P=0.0001], fitness [F (2, 44)= 23.31, P=0.0001] and time × fitness interaction [F (1,44)= 19.75, P=0.0001]. It was observed significant responses for Scheffe test in post-test (P=0.0001).

Table 9) The effects of skill exercises on aerobic, and anaerobic fitness on Obsessive–Compulsive in pre and post-Test

Groups	Pre-test	Post-test	T-test
Control	2.86±0.22	2.91±0.22	0.759
Aerobic	2.87±0.32	2.02±0.14	0.001
Anaerobic	2.91±0.19	2.01±0.09	0.001
Scheffe	0.901	0.0001	
		P-values	
Time	F (1, 44)=21.20, P=0.0001		
Exercise	F (2, 44)=22.31, P=0.0001		
Time* Exercise	F (1, 44)=19.75, P=0.0001		

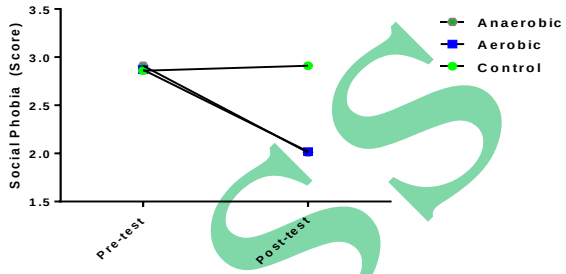

Figure 7) The effect of aerobic, and anaerobic fitness on Obsessive–Compulsive in pre and post-Test

Discussion

The results showed that aerobic and anaerobic fitness had positive effects for decreasing psychological disorders in children with tic syndrome. It was not found any study to show the effects of aerobic and anaerobic fitness on psychological parameters in children with motor tic. Conversely, Strohle et al. [16] assessed the effects of aerobic treadmill exercise on antipanic and anxiolytic activity in patients with panic disorder and showed that anxiety was significantly higher in patients submitted to treadmill exercise. The results are in contrast with our findings. The reason for difference between our findings and others could be attributed to physiological conditions. Parallel to our findings, Bandelow et al. [17] aerobic exercise decreased anxiety symptoms. In other study, Gomes da Silva[18] showed that physical activity affects attention, depression, anxiety, and overall well-being. Other study showed that aerobic and anaerobic fitness improved neuropsychological and electrophysiological performances of working memory in preadolescent children [19]. An animal study assessed the effects of long-term wheel running on anxiety-like behavior in transgenic mice and showed decreased anxiety-like behavior [20]. It was reported that aerobic exercises have positive effects on the density of neural conveyer in neural system and reduce muscular tension and hormones level [20-25]. Other study showed that aerobic exercises decrease the level of stress and anxiety by influencing on automatic neural system and decrease anxiety and depression [25]. Aerobic fitness decreases cortisol level and anxiety [26]. Kim et al. [27] investigated the responses of five participants to aerobic exercises and anaerobic

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exercises and showed that different fitness improved mental health and happiness, each with different degree which verifies the results of the present study. Other study showed that aerobic and group activities are more effective for improving mental well-being compared to anaerobic and individual exercises [25].

Conclusion

In sum, the results showed that the both fitness similarly decreased psychological disorders in children with tic syndrome. It can be suggested using aerobic and aerobic fitness for decreasing psychological disorders in patients with psychological disorders.

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References

1- Nosratmirshekarlou E, Shafiq S, Goodarzi Z.S, Martino D, Pringsheim T. Effect of diet, exercise and sleep on tic severity: A scoping review protocol. BMJ Open. 2019;9:e024653.
2- Robertson MM, Chowdhury U. Behavioral and psychological therapies for Tourette syndrome and tic disorders: Their place in treatment and history. Neuropsychiatry. 2011;1(4): 385-400.
3- Hirschtritt ME, Lee PC, Pauls DL, Dion Y, Grados MA, Cornelia Illman, *et al*. Lifetime prevalence, age of risk, and genetic relationships of comorbid psychiatric disorders in Tourette syndrome. JAMA Psychiatry. 2015;72:325-33.
4- Robinson S, Hindley P, Hedderly T. Tic attacks: panic disorder in Tourette syndrome? Poster on 19th International Congress of Parkinson's Disease and Movement Disorders; 2015 June 14-18; San Diego, CA. Milwaukee: MDS; 2016.
5- Anderson E, Shivakumar G. Effects of exercise and physical activity on anxiety. Frontier in Psychiatry. 2013;4:1-4.
6- Jackson EM, Dishman RK. Cardiorespiratory fitness and laboratory stress: A meta-egression analysis. Psychophysiology. 2006;43:57-72.
7- Rimmele U, Zellweger BC, Marti B, Seiler R, Mohiyeddini C, Ehlert U, et al. Trained men show lower cortisol, heart rate and psycho-logical responses to psychosocial stress compared with untrained men. Psychoneuroendocrinology. 2007;32:627-35.
8- De Kloet ER, Joëls M, Holsboer F. Stress and the brain: From adaptation to disease. Natural Review Neuroscience. 2005;6:463-75.
9- Landgraf R, Wigger A, Holsboer F, Neumann I. Hyper-reactive hypothalamo-pituitary- adrenocortical axis in rats bred for high anxiety- related behaviour. J Neuroendocrinol. 1999;11(6):405-7.
10- Chamari K, Padulo J. 'Aerobic' and 'Anaerobic' terms used in exercise physiology: A critical terminology reflection. Sports Med Open. 2015;1(1):9.
11- Patel H, Alkhawam H, Madanieh R, Shah N, Kosmas CE, Vittorio TJ. Aerobic vs anaerobic exercise training effects on the cardiovascular system. World J Cardiol. 2017;9(2):134-8.
12- Meister S, Faude O, Ammann T, Schnittker R, Meyer T. Indicators for high physical strain and overload in elite football players. Scand J Med Sci Sports. 2013;23(2):156-63.
13- Stein PN, Motta RW. Effects of aerobic and nonaerobic exercise on depression and self-concept. Percept Mot Skills. 1992;74(1):79-89.
14- Shiravand M, Safikhani H. The effect of open versus closed exercises on psychological function in children with tic disorder. GMJ Medicine. 2020;4(1):196-205.
15- Cláudia Fernandez A, de Mello MT, Tufik S, de Castro PM, Fisberg M. Influence of the aerobic and anaerobic training on the body fat mass in obese adolescents. Rev Bras Med Esporte. 2004;10:159-65.
16- Ströhle A, Graetz B, Scheel M, Wittmann A, Feller C, Heinz A, et al. The acute antipanic and anxiolytic activity of aerobic exercise in patients with panic disorder and healthy control subjects. J Psychiatr Res. 2009;43(12):1013-7.
17- Bandelow B, Broocks A, Pekrun G, George A, Meyer T, Pralle L, et al. The use of the Panic and Agoraphobia Scale (P and A) in a controlled clinical trial. Pharmacopsychiatry. 2000;33(5):174-81.
18- Gomes da Silva S, Unsain N, Hugo Mascó D, Toscano-Silva M, Alves de Amorim H, Henrique Silva Araújo B, et al. Early exercise promotes positive hippocampal plasticity and improves spatial memory in the adult life of rats. Hippocampus. 2012;22:347-58.
19- Kamijo K, Pontifex MB, O'Leary KC, Scudder MR, Wu CT, Castelli DM, et al. The effects of an afterschool physical activity program on working memory in preadolescent children. Dev Sci. 2011;14:1046-58.
20- Hutton CP, Déry N, Rosa E, Lemon JA, Rollo CD, Boreham DR, et al. Synergistic effects of diet and exercise on hippocampal function in chronically stressed mice. Neuroscience. 2015;308:180-93.
21- Morgan WP. Affective beneficence of vigorous physical activity. Med Sci Sports Exerc. 1985;17(1):94-100.
22- Farinha JB, Steckling FM, Stefanello ST, Cardoso MS, Nunes LS, Barcelos RP, et al. Response of oxidative stress and inflammatory biomarkers to a 12-week aerobic exercise training in women with metabolic syndrome. Sports Med Open. 2015;1(1):19.
23- Heijnen S, Hommel B, Kibele A, Colzato LS. Neuromodulation of aerobic exercise-a review. Front Psychol. 2016;6:1890.
24- von Haaren B, Ottenbacher J, Muenz J, Neumann R, Boes K, Ebner- Priemer U. Does a 20-week aerobic exercise training programme our capabilities to buffer real-life stressors? A randomized, controlled trial using ambulatory assessment. Eur J Appl Physiol. 2016;116(2):383-94.
25- Heaney JL, Carroll D, Phillips AC. DHEA, DHEA-S and cortisol responses to acute exercise in older adults in relation to exercise training status and sex. Age (Dordr). 2013;35(2):395-405.
26- Klentrou P, Giannopoulou A, McKinlay BJ, Wallace P, Muir C, Falk B, et al. Salivary cortisol and testosterone responses to resistance and plyometric exercise in 12- to 14-year-old boys. Appl Physiol Nutr Metab. 2016;41(7):714-8.
27- Kim JH, McKenzie LA. The impacts of physical exercise on stress coping and well-being in university students in the context of leisure. Health. 2014;6(19):2570-80.

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