

Effect of Twelve Weeks of Aerobic Training on Treatment of Attention Deficit/Hyperactivity Disorder in Children

Mohammad Ebrahim Bahram¹, Negar Akkasheh^{2*}, Mohammad Javad Pourvaghar³

¹ M.A in Exercise physiology, Faculty of Physical Education and sports Sciences, Isfahan University, Iran

² Faculty of Medicine, Semnan University of Medical Sciences, Semnan, Iran

³ Department of Physical Education, Faculty of Humanity, University of Kashan, Kashan, Iran

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Abstract

Purpose: Attention Deficit Hyperactivity Disorder (ADHD) is one of the prevalent disorders in child psychiatry. The main purpose of this study was to investigate the effect of a 12-weeks aerobic training on the treatment of attention deficit/hyperactivity disorder in male primary school students in Kashan.

Material and Methods: This research was a semi-experimental study. The study population consisted of 300 male students in primary schools of Kashan suffering from ADHD between years 2011-12. Thus 60 students with the highest degree of ADHD were selected using Diagnostic Questionnaire Conner (CPRS) and Diagnostic and Statistical Manual (DSM) and were grouped randomly, and according to their demographical characteristics, into a control group (age 9.17 ± 1.55 , weight 31.60 ± 8.11 and height 133.86 ± 8.617) and an intervention group (age 10.53 ± 1.52 , weight 28.06 ± 7.70 and height 132.06 ± 9.04). All psychological and sport protocols were under observation of a psychiatrist and a sport physiologist. Experimental group did aerobic exercises for 12 weeks, 3 times a week, and with 60 to 85 percent of their reserved heart rate, while the control group just followed their routine life. Kolmogorov-Smirnov test was used to check the normality of the data distribution and Independent T-test was used to evaluate the effectiveness of the exercises at the significance level of $p \leq 0.05$. All the data analyses were done using SPSS software (version 16).

Results: There was a significant difference in ADHD ($p=0.000$) of the experimental group in post-test ($p \leq 0.05$). But there was no significant difference in the control group ($p \geq 0.05$).

Discussion and Conclusion: These findings pointed to the role and importance of sport and regular and organized exercises, as a non-invasive and non-medicinal method, in preventing and treatment of child behavior disorders and emphasized on its necessity according to the industrial circumstances ruling human society.

Key words: Aerobic exercises, Hyperactivity, Attention Deficit

Introduction

Nowadays it has been proved that not only young children need physical care but also they do need attention in all aspects of existence including social, emotional, and intellectual growth, as well as needs regarding personality traits [1]. ADHD is one of the most prominent psychoanalytic disorders in childhood. ADHD refers to a state in which the child is excessively active [2]. ADHD was first identified by a German doctor named Heinrich Hoffmann in 1845 and from 1980, American Faculty of Psychiatry has used the term Attention Deficit/Hyperactivity for it. Attention Deficit/Hyperactivity is a collection of behaviors

which is shown by inattention, distraction and hyperactivity [3]. This disorder consists of attention span growth disorder, impulsivity and hyperactivity in which these deficits are considerably uncoordinated with the child's mental age. It starts in childhood. Symptoms are greatly dominant and situational and usually get chronic and stable during time. This disorder does not result directly from intensive language delay, deafness, blindness, autism, children psychotic period and neuropsychology, sensory-motor or emotional disorder [4]. It is an important change for children at the age of school because it could be the base of long lasting unfavorable consequences and damage mental talent evolution process of children and their socio-emotional skills. This disorder has been

* Corresponding author E-mail:
Negar7@gmail.com

called with different phrases such as Minimal Brain Dysfunction, Mild traumatic brain injury, Hyperactivity action in childhood and Hyperactivity syndrome. The mentioned disorder which is the most prevalent childhood disorder is a complicated brain disorder and includes subtle abnormalities created in the function of nervous system [5]. It is important to diagnose behavioral problems which happen at school age, on time and early, because all of mental health expert emphasis that primary compatibility plays a role in future compatibility and having a problem in these years is the base of future incompatibility [6]. It is more apparent in children with ADHD because this disorder affects personal life, educational issues and social relations of a person and if it is not diagnosed and treated, it can cause serious pathological problems in one's life, such as obstinacy, rejection by peers and low self-esteem. It can also lead to problematic relation of the person with other people., Reaction of parents and teachers can also seriously harm evolution process of mental talents and socio-emotional skills of the child. According to research, children with ADHD at the school age will suffer from future turmoils in many of the functions related to their educational development such as active memory, computation of mind, spelling, inner speech, corresponding reading, fluency in speech and written report [7].

Drug therapy is a common method to treat children with ADHD and about 75 percent of these children are treated by administering stimulating drugs [8]. Nowadays utilizing these drugs to treat ADHD is increasing [9], and their efficiency is checked widely. From the perspective of pharmacology, this disorder can be treated by stimulating drugs like Methylphenidate (like Ritalin), and Amphetamine (like adrenal) [10]. It should be mentioned that even though drug therapy has many benefits, as researchers and experts believe, it has many side effects including weight loss, appetite loss, sleep disorder, hallucination, depression, high blood pressure, sadness and crying [11]. One of the suggested ways by psychologists and exercise physiologists to prevent and treat different types of behavior disorders is doing exercises. According to the findings of researchers, there is a close relationship between doing exercises and improvement of behavioral disorders. Sport activity with its proved beneficial effects, can be one of the ways to treat hyperactivity disorders. This method has been known as a strong stimulant for

Hypothalamic, Pituitary-adrenal, Hypophyseal and noradrenergic systems [12]. Considerable evidence signifies the improvement of executive function through doing physical and aerobic exercises that is especially important in the case of children with ADHD. In a research, the impact of play therapy based on cognitive-behavior approach, on severity of ADHD symptoms among 30, 9-11-year old students suffering from ADHD was examined. The obtained conclusion showed that, it was possible to use play therapy and physical exercises as an effective method to treat children and adolescents with ADHD [13]. Taekwondo and Karate are the funniest sport for these children while Baseball is their nightmare because it needs high levels of coordination between hands and eyes (14). Heavy physical activity in such patients, controls the symptoms like restlessness and excessive activity up to 95 percent [1]. In another study the effect of selected breeding games on hyperactivity and attention deficit of children in Aligoudars, Lorestan province, was investigated and results showed the significant effect of breeding games on attention disorder [15]. In a discovering research, the effect of sport activity plan on improvement of psychological and behavioral functions of children with ADHD was observed. Results represented that a structured exercise plan can have a clinical relation with functional consistency of children with ADHD [16]. Another research observed the relationship between sport participation and rate of anxiety in 32 children, aged between 6-14 years, with ADHD. Based on the results, there was a relationship between active sport participation and reduction of depression and anxiety symptoms in children with ADHD, which led to a decline in patients' symptoms [17, 18 19]. Nowadays this disorder is attractive for scientists and researchers for different reasons. First, the disorder is one of the most common disorders between children and adolescents, which causes considerable problems for students, influencing their cognitive, social, emotional and domestic functions as well as job and marriage functions in adulthood. Second, the etiology and treatment of the disorder is not completely specified yet. Third, it seems that better recognition of hyperactivity disorder helps better recognition of many other disorders like conduct disorder, oppositional defiant disorder and learning disability [20]. This disorder is four times more prevalent in boys as compared to girls. On the other hand little research has been done, to control and treat this disorder in Iran. Taking into account the side effects

and limitations of Chemotherapy, and considering the increase of this disorder's prevalence in Iran, the researchers wondered whether it was possible to decrease the hyperactivity of boys in Kashan, using sport activities.

Material and Methods

Intervention

This study was a semi-experimental one, with a pre- and post-test design. The statistical population included 300 male, primary school students in Kashan, between years 2011-2012. 500 questionnaires were randomly distributed and among the 300 collected, 60 subjects with the highest level of ADHD were selected as the study's sample and were randomly divided into two equal groups of control (age 9.17 ± 1.55 , weight 31.60 ± 8.11 , height 133.86 ± 8.617) and intervention (age 10.53 ± 1.52 , weight 28.06 ± 7.70 , height 132.06 ± 9.04) (table 1).

Measures

Conner's Parents Rating -27 (CPRS-27) and C.S.M were used in order to assess children and to ensure the presence of the disorder in them. ., Conners Parents Rating has 27 questions and is completed by children's parents. Grading of the questions is done according to 4-point Likert's scale. This instrument is used to measure the severity of ADHD symptoms. It has been used in different countries and its reliability and validity is approved. In a research done to standardize short forms of parents grading scale of conners, stability coefficient retest was 58% for total score, Cronbach's alpha coefficient was 73% for total score, and its reliability was 84%. The questionnaire includes cognitive, physical features and commitment to collaboration, as well as consent to participate in research [21, 22].

Exercise protocol

Experimental group started aerobic exercises for 12

weeks, 3 times a week, with 60 to 85 percent of their maximum heart rate of maximum reserve, while the control group remained sedentary.. The exercise session began with 5-7 minutes of warm up, which started by walking, and continued by stretching upper and lower body muscles. The warm up followed by various funny movements selected to increase body temperature and flexibility in order to prevent probable muscular injury. Aerobic exercises were done for 12 weeks, 3 times a week. The intensity of the exercises gradually increased from 60 to 85 percent of maximum heart rate maximum reserve , so that during the first 4 weeks, the aerobic exercise lasted for 25 minutes, with the intensity of 60-75 percent of heart rate of maximum reserve , and in the next 8 weeks, the time of exercise increased to 35 minutes and the intensity to 70-85 percent of maximum heart rate. . According to the age and other circumstances of the subjects, it was tried to choose funny movements which could arise a sense of competition among the participants. Each session ended with a Cooling down including mild running with 30-45 percent of heart beat of maximum reserve , followed by stretching.

Statistical Analyses

Kolmogorov-Smirnov test was used in order to check the normality of data distribution and independent t-test was done to assess the effectiveness of the exercises. . The significance level was set at $p \leq 0.05$. All the data analyses were done using SPSS software (version 16).

Results

Demographic features of the participants are shown in table 1. According to figure 2 and 3, 8 weeks of aerobic training made a significant difference in ADHD. In other words, 8 weeks of aerobic exercises decreased ADHD symptoms in children ($2.87 \pm 0.19 = M \pm SD$) by -18.52 percent ($P=0.0000$). But there was no significant difference in the control group ($P \geq 0.05$).

Table 1: Demographic features of control and experimental group

Group	Control (n=30) Mean \pm SD	Experimental (n=30) Mean \pm SD	P- value
Age (Years)	9.17 \pm 1.62	10.53 \pm 1.55	*0.581
Weight (kg)	31.60 \pm 8.11	28.06 \pm 7.70	*0.231
Height (cm)	133.86 \pm 8.617	132.06 \pm 9.04	*0.981

*Significance Level $p \geq 0.05$

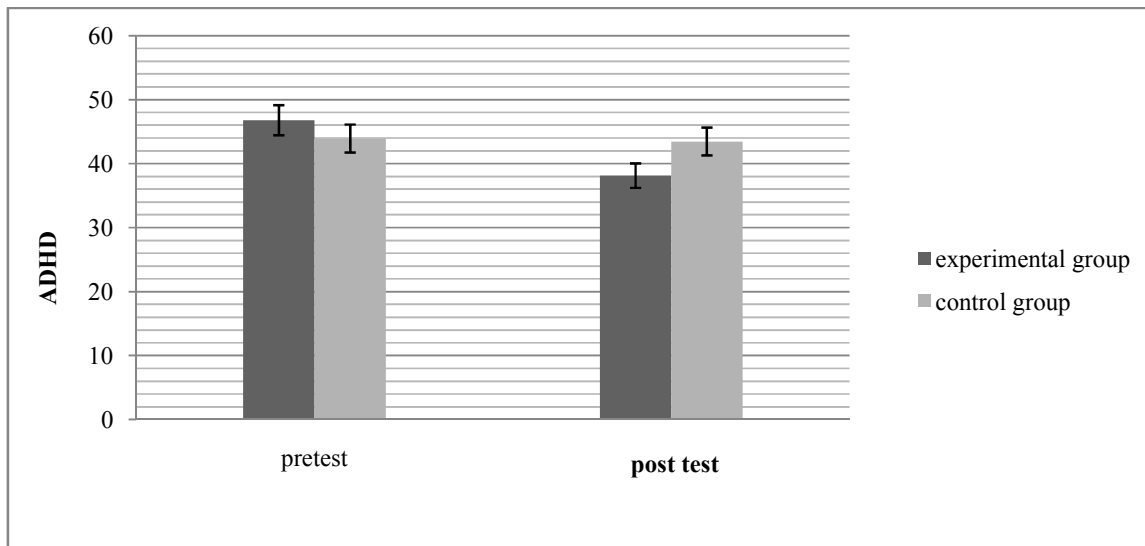


Figure 1: pre and post-test values of ADHD symptoms in the two study groups

Table 2: Results of ANCOVA Test of ADHD in the two study groups

group	Experimental (30 people) X ± SD		Control (30 people) X ± SD		Statistical Index indicators		
	pretest	Post test	Pretest	Post test	T	Changes(percent)	significance Level
ADHD	46.80 ± 2.83	38.13 ± 3.02	43.93 ± 6.23	43.46 ± 6.29	16.629	-18.52	0.000*

*: Significance Level $p \leq 0.05$

Discussion and Conclusion

This research was undertaken to examine the effect of 12 weeks of aerobic exercise on primary school students of Kashan who suffered from ADHD, between the years 2011-2012. Results showed a significant difference in the experimental group comparing the pre- and the post-tests. That is to say, the group which had 12 weeks of aerobic exercise, recovered from ADHD. The present results are compatible and consistent with those of the studies which examined the effect of physical activities on severity of ADHD symptoms in children with ADHD. Based on the literature it is possible to use games and physical activities as an effective therapeutic method for children and adolescents with ADHD [13, 14]. Also physical activity decreases severity of ADHD symptoms, may have clinical significance in functional consistency of children with ADHD, and be useful in controlling symptoms like restlessness, anxiety and excessive activity up to 95 percent [16, 17]. The above findings are in line with the present article.[18, 19]. It might be possible to attribute the effects of aerobic exercises on ADHD to some quasi-hormones like Endorphins. These play a role in body relaxation and might be effective in

reduction of ADHD. This could happen as a result of making physiological changes like regulating cardiovascular system which in turn reduces aggression and attention deficit [23]. Among biological, physiological and mental mechanisms explaining the effects of exercise on reduction of anxiety, depression and ADHD, the biological benefits exercising makes it possible for the person to achieve fitness. It also affects neurotransmitters levels influencing anxiety, affects stress hormone levels and reduces muscle tension [24,25]. From mental aspect, doing exercise increases positive aspects of conditional response, and distracts one’s attention from threatening and anxiety-causing circumstances. It is also beneficial in increasing self-confidence and self-improvement , and can reduce ADHD, anxiety and depression [26], because physical education develops motor behavior and at the same time helps improving children's social behavior which is necessary to their world compatibility and developing proper social criteria. On the other hand, participating in group exercises leads to increased focus on core [27]. It reminds that behavior therapy is effective and that parents might prefer behavioral treatment instead of drug-only remedies. Through playing

games and exercising, a child finds a chance to show whatever happens inside his/her mind; things like tensions, hopelessness, aggressions and wanderings and to evacuate this compressed energy in the environment. Based on the obtained results and the positive effects of aerobic exercises in decreasing behavioral disorders, it is suggested to make use of group physical activities in treating children with these disorders. These exercises must be planned with the aim of developing behavioral needs and improving basic physical abilities of children. Therefore, filling the children's leisure time with sports and encouraging them to participate in sport competitions can be ways to achieving balance in children with disorders. According to findings of the present research, it can be concluded that 12 weeks of aerobic exercise can improve and decrease symptoms of ADHD in children. Also, these exercises could reduce depression, anxiety and attention deficit and improved the children's social interactions. Lack of sufficient attention to mental health issues in children can lead to higher incidence of these problems and making them chronic. Considering the significance of this matter, any efforts to diagnose, prevent, control and treat behavioral and mental disorders are valuable. These findings showed the role and importance of sport and regular and organized physical activity in prevention and treatment of children's behavioral disorders, as a non-invasive and non-medicinal method, emphasizing on its necessity in the industrial societies.

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Authors' Contribution

Mohammad Ebrahim Bahram, Goudarz Akashe and Mohammad Javad Pourvagar were responsible for the study design, literature search, and manuscript preparation and editing. Ali Fadakar also participated in the study design, and data analysis.

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