

## The Effectiveness of Swimming Training on Reducing Coping Behaviors, Cognitive Problems and Inattention of Elementary School Hyperactive Girls

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### Abstract

**Background:** The increase of ADHD affects family relations and the mental health of family members as well as the child himself. The main purpose of this study was to determine the effectiveness of swimming training on reducing coping behaviors, cognitive problems and inattention of Elementary School female students with hyperactivity disorder.

**Method:** The present applied research follows a descriptive-analytical method and a pre-post test experimental-control design. The participants included children with signs of hyperactivity (age=7.2±1.6 years) from welfare centers of Tabriz. The participants were randomly assigned to two experimental (n=15) and control (n=15) groups. Before the initiation of the training program, the Conners questionnaire (parent form) was completed by the parents. The training was held every week in two 45-minute sessions for 2 months. At the end of the training, a practical test was performed according to the standards of the province sports board, and the scores were recorded on special sheets. After completing the exercises and testing, the Conners questionnaire for parents was again distributed among the parents. T tests were used for analyzing the data.

**Results:** The results showed that swimming had a significant positive effect on reducing coping behaviors, cognitive problems and inattention of elementary school hyperactive girls.

**Conclusion:** Exercise strengthens the primary atrial nervous system and promotes superior brain functions such as motor skills and integration in action, which can reduce social maladaptation by creating a conducive environment for increased self-confidence and empowerment.

**Key Words:** Cognitive problems, Coping behaviors, Elementary school girls.

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## 1- INTRODUCTION

The published statistics have shown the increasing prevalence of ADHD all around the world. An increase in the rate of this disorder has been reported in Iran where its prevalence has been reported to be 6 to 18 percent in different cities. Research in this field is, then, inevitable. Furthermore, it should be considered that the increase of this disorder puts both economic and managerial pressures on both of the health and the educational systems of the country, and directly affects family relations and the mental health of family members as well as the child himself. Hyperactivity is a biological disorder which is activated by environmental factors such as nutritional issues, air pollution, pressures and stresses during pregnancy and other factors. Thus, it is important to thoroughly investigate and find the factors that can have a positive effect on the prevention and treatment of this disorder (1).

Various studies have shown that children with ADHD cannot use their abilities in learning, socializing and behavioral management, and face many difficulties because of the problems with parents and other family members, teachers, classmates and others. They are, as a result, rejected by the people around them and develop low self-esteem, which by itself leads to the tendency of these children to join groups that lead them to delinquency. If the necessary follow-ups are not done to solve the problems of these children, the complications caused by this disorder in adolescence and adulthood will overshadow the person's performance and sometimes deviate the person from the normal course of life; and also these people usually cannot make optimal use of their abilities (2). Research conducted in the country has shown that drug therapy is used much more than non-drug therapies. As we know, according to research, 70% of people benefit from drug therapy, and in

30% of cases, drug therapy is not useful. In addition, due to the side effects of the drug, especially in children who are growing up, there is usually resistance to use it. These important and influential issues along with the lack of extensive research testing different non-drug therapies has led the researcher to conduct the present study.

The few studies on non-drug treatment have indicated the effectiveness of exercise on attention deficit/hyperactivity disorder (hyperactivity). For instance, Jalali et al., who aimed at investigating the effects of an exercise program on reducing the symptoms of hyperactive children. They reported that the scores of both attention deficit and hyperactivity/impulsivity subscales decreased under the influence of the exercise program and the scores decreased over time (3). Regular participation in exercise has, therefore, a great positive effect on mental and physical states causing good mood, reduced depression, restlessness and anxiety (4). One study looked at participation, exercise anxiety, and anxiety in hyperactive children. In general, exercise and play are natural and enjoyable activities for children, which help them develop their motor, social and personality skills. Ghasemi (5) concluded that different exercises are effective in reducing this deficiency of attention and concentration in children with attention deficit and hyperactivity disorder.

In the current study, non-pharmacological swimming treatments were used, because such training generally affects the social relationships of these children. If the children's behavioral performance is improved, the child's problems with family members, peers and other people will be reduced. Using regular sports activities helps to create a state of physical relaxation for the child; and this physical relaxation can be directly useful on his/her level of attention and impulsive behaviors.

This can solve children's behavioral problems and increase their attention and concentration. Hence, the researcher tries to compare the two sports activities in this research and also examine the effectiveness of each method on the subscales of coping behaviors, cognitive problems and inattention. This study can also smooth the way for conducting other research in this field to find simple and safe methods, which can be used for specific purposes (6).

Finally, considering the relatively high prevalence of ADHD in primary school students and its adverse outcomes and complications, it seems necessary to consider programs for early detection and treatment of this disorder in order to improve the mental health of this group of students. Although drug treatment is very important, the coordination of psychologists, teachers and social workers can play an important role in treatment. Many of the hyperactive children, simultaneously, suffer from other psychological problems for which the psychotherapy interventions seem necessary (7). Therefore, the present study compares the effectiveness of swimming exercise on reducing coping behaviors, cognitive problems and inattention of children with ADHD, aged 6 to 8 years.

Attention includes a set of cognitive and metacognitive abilities including self-management, self-initiation, planning, cognitive flexibility, working memory, organization, dynamic perception of time, and problem solving in daily activities, which can help children in learning and doing school assignments (9, 10).

A review of articles on children's exercise therapy, while showing its many benefits in the areas of relaxation and behavior control, has shown that most research has been conducted on limited and small samples. However, the available evidence has led the researchers to claim that exercise is associated with physical and

behavioral performance (10). Examination of changes in brain waves has shown the effect of breathing exercises on the brain. Exercise also has the potential to increase and improve attention span and emotional control (11). Yoga increases self-control, attention, concentration, self-awareness, body awareness and reduces anxiety. Physical and respiratory exercises can help with physical strength and flexibility; additionally, they can increase the distribution and absorption of oxygen and the function of hormones. Further, they can affect the parasympathetic nervous system and balance the autonomic nervous system, which helps increase resistance to stress. Physical and motor exercises create coordination and flexibility; and they increase the power of concentration and alertness in children. They also increase self-confidence and prevent growth disorders (12).

Today, exercise therapy programs are one of the interventions that have gained desirable experimental support. Therefore, the present study examines the effectiveness of swimming in reducing this failure.

## 2- METHODS

The present applied research follows a descriptive-analytical method and a pre-post test experimental-control design.

### 2-1. Statistical Society

The statistical population of this study included 65 children with symptoms of hyperactivity (age=7.2±1.6 years) from welfare centers in Tabriz.

### 2-2. 2-3. Participants

Due to the limitation of the number of ADHD students in Tabriz city, a briefing session was held for all parents of children with hyperactivity in the welfare centers; and 30 parents participated voluntarily in the treatment program. Then, based on the number of parents who wished to participate in the project, their children

who did not attend any of the swimming training classes were randomly assigned to the experimental (n=15) and control group (n=15).

#### 2-4. Research measurement tools

*Conners Attention Deficit/Hyperactivity Disorder Symptoms Questionnaire (Parent Form)* (11): This scale was used to assess the symptom of Attention Deficit Hyperactivity Disorder. The short form of this questionnaire, which has been translated and validated by the Iranian Institute of Cognitive Sciences, consists of 26 Likert scale items (1 to 4 score); and can be administered individually or in groups.

#### 2-5. Validity of tools

The following results were obtained in a study conducted by Shahim et al. (13) in order to standardize and identify the psychometric properties of the Conners-Teacher Grading Scale. The reliability of the scale with the retest method varied from 0.76 for the whole scale and from 0.68 for the subscales from 0.68 for passivity to 0.82 for behavior problems. Cronbach's alpha coefficient for the whole questionnaire was 0.86, and for subscales ranged from 0.74 for hyperactivity to 0.89 for inattention-dreaming. Also, the Institute of Science Studies (2001) reported the validity and reliability of the 26-item Conners Teacher Questionnaire, in Iran, as 0.75 and 0.90.

#### 2-6. Data collection method

The participants included children with symptoms of hyperactivity (age=7.2±1.6 years) from welfare centers in Tabriz city.

Using voluntary sampling of the parents who were willing to participate in this study, the necessary number was selected and a briefing session was held. Parents who wanted their children to participate in the desired treatment program were registered. Their children were then randomly assigned to the experimental and control groups; thus, the participants were placed into two groups of 15 for swimming and 15 for control. Swimming training classes were held in one of the pools in Tabriz. Before the start of the training program, the Conners questionnaire (parent form) was completed by the parents. Swimming lessons were held from 12:00 to 13:00 by a swimming instructor and a psychiatrist. The training was held every week in two 45-minute sessions for 2 months. After the training sessions, a practical test was performed according to the standards of the provincial sports board and the scores were recorded on special sheets. After the training sessions and the test, the Conners questionnaire was completed by the parents again.

#### 2-7. Statistical analysis methods

For data analysis, in addition to calculating descriptive indices, t-tests were performed to identify the differences.

### 3- RESULTS

According to **Table 1**, in the control group, 26.7% were 8 years old, 0.40% were 9 years old, and 33.3% were 10 years old. In the experimental group, 33.3% were 8 years old, 46.7% were 9 years old, and 20.2% were 10 years old.

**Table-1:** Frequency distribution of subjects' age

Age	Xperimental		Control	
	N	Percent	N	Percent
8	5	33.3%	4	26.7%
9	7	46.7%	6	40%
10	3	20%	5	33.3%
Total	15	100	15	100

According to **Table 2**, it can be seen that the effect of the group is significant at the level of 99% probability ( $p=0.001$ , Eta square=56,  $F=33.83$ ). That is, after adjusting the pre-test scores, the coping behaviors mean score in the post-test of the control group is significantly different from that of the experimental. On the other hand, the adjusted means indicate that the

mean score of coping behaviors in the experimental group ( $m=15.08$ ) is significantly lower than that in the control group ( $m=17.12$ ). Therefore, it is concluded that the exercise of frog swimming has a significant positive effect on reducing the coping behaviors of hyperactive girls aged 6 to 8 years.

**Table-2:** Results of analysis of covariance to evaluate the difference between coping behaviors in the post-test between the experimental and control groups

Source of change	SS	df	A S	F	Sig.	Eta squares
The effect of pre-test	267.04	1	267.04	290.48	0.001	0.915
Group effect	31.10	1	31.10	33.83	0.001	0.556
Error	24.82	27	0.919	-	-	-
Total	8109	30	-	-	-	-

According to **Table 3**, it can be seen that the effect of the group is significant at the level of 99% probability ( $p=0.001$ , Eta squared=0.68,  $F=57.78$ ). That is, after adjusting the pre-test scores, the rate of cognitive problems and lack of attention in the post-test in the control group and the experimental group has a significant difference. On the other hand, the adjusted means indicate that the rate of cognitive

problems and inattention in the experimental group ( $m = 6.95$ ) is significantly lower than that in the control group ( $m = 8.52$ ). Therefore, it is concluded that the exercise of frog swimming has a significant positive effect on reducing cognitive problems and inattention of hyperactive girls aged 6 to 8 years.

**Table-3:** Results of analysis of covariance to investigate the differences between cognitive problems and lack of attention in the post-test between the experimental and control groups

Source of change	SS	df	A S	F	Sig.	Eta squares
The effect of pre-test	80.79	1	80.79	255.31	0.001	0.904
Group effect	18.28	1	18.28	57.77	0.001	0.68
Error	8.54	27	0.31	-	-	-
Total	1906	30	-	-	-	-

According to **Table 4**, it can be seen that the effect of the group is significant at the level of 99% probability ( $p=0.001$ , eta square= 0.73,  $F=73.92$ ). That is, after adjusting the pre-test scores, the lack of attention is significantly different in the post-tests of the control and the experimental groups. On the other hand, the adjusted means indicate that the rate of

ADHD with attention deficit in the experimental group ( $m = 7.11$ ) is significantly lower than that in the control group ( $m = 8.96$ ). Therefore, it is concluded that frog swimming exercise has a significant positive effect on reducing ADHD with attention deficit hyperactivity in 6 to 8 year old girls.

**Table-4:** Results of analysis of covariance to evaluate the difference between the post-test attention deficit in the experimental and control groups

Source of change	SS	df	A S	F	Sig.	Eta squares
The effect of pre-test	69.25	1	69.25	198.66	0.001	0.88
Group effect	25.76	1	25.76	73.91	0.001	0.73
Error	9.41	27	0.34			
Total		30				

#### 4- DISCUSSION

The results revealed that the exercise of frog swimming had a significant positive effect on reducing the coping behaviors of hyperactive 6-to-8-year-old girls. The results of this research are consistent with those of Sabzi et al. (1), Dana and Christodoulides (2), Jalali et al. (3), Ghasemi (5), Salehian and Golabchi (15), Dana and Shams (16), Saber et al. (17), and are dissimilar with the results of Jensen and Kenny (10), Saadat (16). Although there were some conflicting results in other studies, the intervention used in this study was found to be significantly effective in Attention Deficit Hyperactivity Disorder, and reduced inappropriate behaviors and increased attention span in the hyperactive children. Research on the effects of yoga in the treatment of attention deficit/hyperactivity disorder has also shown conflicting results. Jensen and Kenny (12) reported a significant reduction in hyperactive behaviors after 20 sessions of yoga practice (7), and Parshad (13) stated that physical and motor exercises create coordination, flexibility and increase concentration and alertness in children; however, Harrison et al. (16) did not find any obvious change in the sign of attention deficit/ hyperactivity disorder, but their results showed that after 12 Yoga therapy sessions, they had better sleep and less anxiety. Ware (18) also did not find any significant effect in improving the symptoms of attention deficit hyperactivity disorder or did not observe impulsive behaviors. Neuro-imaging has shown that

children with attention deficit disorder have problems with the cerebellum and forehead which have basic functions in thinking, planning, organizing, decision-making, time perception and inhibition and physical activity during different weeks. Exercise changes the function of the forehead, thus facilitating concentration and ultimately planning, decision-making and creativity. It has also been shown that regular physical activity plays a crucial role in regulating the attention of these children by increasing the levels of neurotransmitters epinephrine and norepinephrine in the brain (21). Although very little information is available on the effect of exercise on behavioral disorders in hyperactive children, these researchers have reported the effective and positive role of exercise in reducing anxiety and believe that regular exercise helps emotional discharge and release of accumulated energy (2). In fact, a structured exercise program can have a clinical effect on functional adjustment in hyperactive children, by increasing blood flow to the brain and increasing levels of neurotransmitters such as dopamine. Norepinephrine and serotonin leads to peace of mind as well as emotional stability. Disorders in the pathways of neurotransmitters in the brain have been shown in the neuropsychological and behavioral characteristics of hyperactive children (21). Other studies have shown that the levels of neurotransmitters will change with exercise (16).

Exercise, as an important part of behavioral skills training methods,

provides an opportunity to evaluate and correct mistakes. Given that the evaluation process requires focus and maintenance of attention to mistakes, we can expect the regular exercise to provide us with increased focus and ability to maintain attention. Given that families are reluctant to take stimulant medications due to their side effects, exercise can be effective as a complementary method in improving the symptoms of hyperactive children and balancing them.

The results of the present study showed that frog swimming exercise had a significant positive effect on reducing the cognitive problems of hyperactive girls aged 6 to 8 years. This is consistent with the results of Sabzi et al. (1), Dana and Christodoulides (2), Dana and Christodoulides (2), Jalali et al. (3), Ghasemi (5), Salehian and Golabchi (13), Dana and Shams (14), Saber et al. (15) and dissimilar to the results of Jensen and Kenny (12).

Children with attention deficit/hyperactivity disorder have widespread and severe educational problems. In fact, many of them initially refer for treatment because of school-related problems. Educational problems are common among these children. Although studies indicate problems in the whole field of study, academic problems are mainly related to motivational problems, attention problems, and weakness in test-answering skills. These children are overworked and have difficulty in concentrating without thinking about acting. They may not understand what is expected of them, and they may find it difficult to obey because they cannot be silent and focused, or pay attention to details (15).

It often seems that children have a distraction disorder, as if they do not hear or do not listen to what is being said. They may frequently switch from one unfinished activity to another. People who are

diagnosed with the disorder may start with a task and leave it unfinished and move on to another job and then move on to another job without completing any of them. They often do not follow instructions or requests and are unable to complete their homework, daily chores and other assignments. Inability to complete assignments is considered to make this diagnosis only when it is due to lack of attention and not another reason (such as inability to understand instructions). These people often have difficulty in organizing homework and activities (16).

Tasks that require constant mental effort seem unpleasant and extremely annoying to them. As a result, they avoid or show a strong dislike for activities that require constant personal effort and mental effort or a great deal of organization and concentration (such as homework or writing). The reason for this avoidance should be the person's concentration problems, not the attitude of primary disobedience, although secondary oppositions may also appear. Work-related habits in these people are often erratic and disorganized, and they often scatter, lose, use carelessly, and damage materials needed for homework. People with this disorder are easily distracted by any unrelated stimulus. They often interrupt their work based on trivial noises or events that are easily overlooked by others (such as car horns or trivial conversations). These people are often forgetful in their daily activities, such as forgetting to make an appointment or not having lunch. Lack of attention in social situations may result in frequent switching of topics, not listening to others, not paying attention to conversations and not following the rules or details of games or activities (1).

The results of the current study demonstrated that frog swimming exercise has a significant positive effect on inattention of hyperactive girls aged 6 to 8 years. This finding is consistent with that

of Sabzi et al. (1), Dana and Christodoulides (2), Jalali et al. (3) Ghasemi (5) Salehian and Golabchi (15), Dana and Shams (16), and Saber et al. (17), but dissimilar with the results of Jensen and Kenny (12)

Lack of attention may be manifested in educational, professional or social situations. People with the disorder may not be able to pay close attention to details or may be reckless in doing homework, work, or other activities. The work of these people is often erratic and is done with carelessness and without enough thinking. Maintaining attention to homework or games is often difficult for these people and they can hardly persevere to complete homework (12).

Amini (22) in the study of the effect of gymnastic exercises on the attention functions of children with developmental coordination disorders showed that the gymnastics training program can be effective in improving the attention function of those children. Ghasemi (5) in a study of the effect of exercise interventions on sustained attention and concentration in children with attention deficit and hyperactivity disorder concluded that different exercises are effective in reducing this deficiency.

In explaining this issue, it can be acknowledged that attention is important as a key factor in learning and performing any task. Considering that in practicing, the learner focuses his attention on matters related to the practice and refrains from focusing on unrelated matters. Therefore, performing exercises that require attention can help children with the disorder (23).

The effect of exercise can be attributed to some hormone-like hyperactivity of aerobic interval, the secretion of which relaxes the body and thus reduces hyperactivity. Studies by some researchers on the body's metabolism show that exercise has a positive effect on the neurochemical part of

the brain, and for example, by increasing dopamine, it stimulates the brain. Increased sensitivity of dopaminergic receptors is effective in responding to dopamine secretion due to exercise. Also, hyperactivity has been reported to be decreased in this way (23). It reabsorbs serotonin in the brain, which plays an important role in reducing attention deficit and hyperactivity. Exercise reduces the action potential in the atrial sinus node of the heart by making physiological changes such as regulating the cardiovascular system, especially by affecting the parasympathetic autonomic nervous system and stimulating the vagus nerve. It can be expected that a decrease in impulsivity can also be expected (24). One of the other mechanisms in reducing optimal physical fitness is participation in group and competitive activities and increasing motivation for active presence in the group. Exercise is known as a potent stimulant for the hypothalamic, mucosal-adrenal, pituitary, and noradrenergic systems. There is a lot of agreement on the development of executive function through physical hyperactivity, which is especially important for children with ADHD. Aerobic exercise has a positive effect on the executive control of movements, i.e. planning, scheduling, and working memory, interventional control, and coordination of tasks. Research shows that exercise increases the positive aspects of response and provides opportunities to divert attention from threatening and anxious situations. Depression Hyperactivity Exercises and rehabilitation, while developing motor behaviors, help children develop social behaviors that require them to adapt to the world around them and various environmental phenomena, and lead them to desirable social norms (25).

Some researchers believe Attention Deficit Hyperactivity Disorder is a neurological disorder, which defects the frontal lobe; and the executive functions of the brain are

among its main causes. Therefore, performing some exercises can reduce the severity of the disorder and the problems associated with it. Exercise and movements are one of the treatment programs that have significant effects on different studies. Exercise can, thus, help children reduce their behavioral problems by affecting the nervous system (24-26).

## 5- CONCLUSION

Exercise strengthens the primary atrial nervous system and promotes superior brain functions such as motor skills and integration in action, which can reduce social maladaptation by creating a conducive environment for increased self-confidence and empowerment. The limitations of this research can be the level of physical and mental fitness during the research (lack of control over the effect of participants' psychological issues on training performance and tests) and psychological factors (such as personality traits) and genetic factors affecting the variables under investigation. According to the results of the research, it is suggested that special attention be paid to the implementation of sports activities and play therapy in this type of child. It is suggested that to include swimming activities in the educational and recreational programs for children with cognitive problems. It is suggested that this intervention be performed for a longer period of time and its effect on the academic and interpersonal performance of patients be investigated. Given that this study was conducted on girls aged 6 to 8 years, it is suggested that a similar study be conducted on boys; and the impact of swimming as well as the other sports on reducing ADHD can be also investigated in different communities.

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