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Original Article

The effect of cognitive-behavioral strategy training on the symptoms of ADHD in preschool children

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Abstract

The main purpose of this study was to examine the effect of cognitive-behavioral training on the symptoms of ADHD in preschool children. The research method was quasi-experimental including pretest-posttest with control group. The population of this study included 2102 girls and boys in preschool centers of Meshgin Shahr (1104 boys and 998 girls) in 105 classes. By cluster sampling, 30 participants (15 in the experimental group and 15 in the control group) were randomly selected and were divided into control and experimental groups. For data collection, the Connors Parent-Teacher Scale was used, and for the cognitive-behavioral training, the Peter J. Billing Training Package was used and the data was analyzed by multivariate covariance (MANCOVA). The results showed that cognitive-behavioral training had a significant effect on the symptoms of ADHD ($p < 0.05$). Therefore, from the results, it is concluded that cognitive-behavioral training significantly reduced the symptoms of ADHD in preschool children.

Keywords

ADHD
Cognitive-behavioral
Strategy
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Introduction

One of the most important mental health issues is the mental health of children. Since childhood is one of the most influential and sensitive parts of life, so attention to mental health at this age is vital. Because identifying and resolving the behavioral and personality troubles at an early age is a great help in forming a healthy personality in adulthood. This is while the transition from tradition to modernity has caused children and adolescents to be exposed to all kinds of mental damage, so that recent research shows that 15-20% of Iranian youngster suffer from some kind of mental disorders (Hirvikoski, 2011) in preschool. Mental disorders are usually related to physiological disorders, such as sleep and eating disorders, which occur because the child's physiological rhythms are not yet completed. At this age, the child also suffers from anxiety, which is due to separation from parents. ADHD is the most common disorder in preschool children (Das Banerjee, 2007). ADHD is a developmental neurological disorder that is characterized by three main properties of attention deficit, hyperactivity and impulsivity. It affects 3-7% of all kids (American Psychiatric Association, 2013). However, in the past years, there was a misconception that this disorder improves in the later years of adolescence, but nowadays it is clear that this disorder moves onto adulthood in more than 50 to 75% of cases (Wallander & Hubert, 1985) with age of onset in ADHD determined before 5 (World Health Organization, 2012) or 7 years old (American Psychiatric Association, 2013). Children with ADHD symptoms usually don't do well in school (Burt, Krueger, McGue, & Iacono, 2001), and they are weak in interpersonal relationships (Greene, Biederman, Zerwas, Monteaux, Goring, & Faraone, 2002). They have attention problems and deficiency in executive functions and mostly they lack cognitive, social, and emotional skills which are necessary to meet the demands of adults (Hommersen, Murray, Ohan, & Johnston, 2006). Attention Deficit-Hyperactivity Disorder (ADHD) treatment is mainly based on

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medication, cognitive-behavioral strategies, educational-psychological child-centered interventions and educational-psychological combined (parent education and child education) interventions (Kazdin & Wassell, 2006). Numerous studies have shown the effectiveness of child-centered educational-psychological interventions which include cognitive, social and interpersonal skills training, attention and patience training also ability to control arousal, ability to reflect and think and problem solving (Hirvikoski, 2011). One of the most appropriate ways to treat these disorders is to use cognitive-behavioral strategies. Cognitive-behavioral strategies are thoughts that affect the process of storing and retrieving information efficiently in memory. These strategies help the individual prepare to combine new information with previously learned information and also store it in long-term memory. Cognitive-behavioral therapy for children is based on the general principle that mental disorder is created and lasted by "dysfunctional" thought and behavior patterns. In other words, at least part of the disorder is conceptualized as a consequence of the individual's cognitive distortions that analyze positive coping and problem-solving behaviors. Till now, cognitive-behavioral therapy for children has been primarily behavioral in content, but in recent years there have been significant advances in understanding the cognitive aspects of childhood psychological problems (Das Banerjee, 2007). The results of research by Mohammadi et al. (2017) showed that cognitive-behavioral education significantly reduced the symptoms of ADHD and increased children's self-regulation. A study by Oortmerssen et al. (2019) showed that full cognitive behavioral therapy led to significant improvement in ADHD symptoms in hyperactivity disorder patients. The results of research by Risley et al. (2020) revealed that parental behavioral education for the treatment of ADHD and ADHD-like behaviors for preschool children at risk of hyperactivity is effective. Also, the results of a research by Rahbar Karbasdehi et al. (2017) indicated that social skills training is effective in reducing emotional-behavioral problems and symptoms of ADHD. But in return, the results of DuPaul et al.'s (2016) research showed that social skills training could not have a significant effect on improving the performance of students with ADHD such as response inhibition and reducing emotional-behavioral problems.

The main purpose of this study was to determine the effect of cognitive-behavioral strategies training on the symptoms of ADHD in preschool children.

Method

Participants

This study in terms of purpose was applied and in terms of method was quasi-experimental with pre-test and post-test design and a control group. According to Table 1, in cognitive-behavioral training program of Hasan Abadi et al. (2012) for hyperactivity syndrome, the experimental group was trained for 14 minutes in 14 sessions, but for control group no intervention was applied. At the end of the training sessions, both control and experimental groups took the post-test. The data were analyzed by using multivariate analysis of covariance with SPSS software, Ver. 22.

The population of this study included all girls and boys in preschool centers of Meshgin Shahr city amounting to 2102 people (1104 boys and 998 girls) in the academic year 1397-1398 selected by cluster sampling. Out of 105 classes, 30 classes were randomly selected. To identify children with ADHD, by screening children in the population, those children who had ADHD by the views of parents and educators on the research scale (a standard deviation above average), 30 children were randomly selected as the sample. They were assigned into an experimental (n = 15) and a control (n = 15) group.

Instrument

The Conner's Hyperactivity Scale (1970) (Parent Rating Scales)

The parent rating scale is answered by parents based on their observations and information about observable behaviors in children aged 4 to 18 years. In this study, the 26-item form of this scale has been used which includes five dimensions A: Attention Deficit/Memory Problem, B: Restlessness/Hyperactivity Disorder, C: Impulsivity, D: difficulty in self-concept, and E: Attention Deficit Hyperactivity Disorder symptoms. Conners (1973) estimated the reliability of the Conners Parent Rating Scale in the range of 0.7 to 0.9. Studies in Iran also shows that the Conners parental rating scale has sufficient validity and reliability. The construct validity of Conners forms has been obtained using factor analysis. The differential validity strongly confirms the ability of this questionnaire in differentiating people with ADHD and normal people and other clinical groups (Amiri, 2016).

The Conners Hyperactivity Scale (1969) (Teacher Rating Scales)

Through hundreds of research studies and decades of clinical usage, it has become clear that the Conners Teacher Rating Scale has been useful in general screening usage for childhood disorders and problems. If the information obtained from both teacher and parents and combined to achieve a complete diagnostic evaluation, it will be useful (Sadock & Sadock, 2003; Hassanabadi et al., 2012). This scale, which is completed by teachers on hyperactivity syndrome in children, has 38 items and it measures the three dimensions of the child's behavior in school (items 1 to 21), participation and group cooperation (items 22 to 29) and attitude towards authorities (items 30 to 38). For each mentioned phrase

and scale in terms of severity and status of the behavioral problem, four degrees are considered. The respondent is asked if there is no behavioral problem in the child at all, check the first option (not at all), if the problem is small, the second option (low), if the severity of the problem is moderate, the third option (medium), and if the problem is high, the fourth (high) option. To score this scale, it is done like "not at all = 0, low = 1, medium = 2, high = 3". The Conners teacher rating scale has sufficient validity and reliability. Conners reported the reliability of the grading scale through a one-month re-test at 0.91 (Goldestin, 1998).

The Cognitive-Behavioral Training Program of Hassanabadi et al. (2012) for children with ADHD

The model of Hassanabadi et al. (2012) has been used for cognitive-behavioral education on children with ADHD, which used in a study entitled "The Comparison of Cognitive Behavioral Therapy (CBT) vs Drug Therapy Effect in Reducing Symptoms of Attention Deficit Hyperactivity Disorder (ADHD)". This pattern is described in Table 1 which is prepared in 14 sessions and each session lasts for 60 minutes.

Table 1. Cognitive-behavioral training program for ADHD

Sessions	Content
First	Introduction meeting (good communication), contract on treatment and program implementation, explanation of relaxation plan (body relaxation training), presenting rewards (score), presenting homework
Second and third	Session 2: Reviewing the past homework, reviewing the emotion recognition plan (anger, happiness, ...), reviewing the relaxation plan (body relaxation training), presenting rewards (score), presenting homework
Fourth and fifth	Session 3: Reviewing the past homework, reviewing the emotion recognition plan (thought, feeling, body, sadness, ...), reviewing the relaxation plan (body relaxation training), presenting a reward (score), presenting homework
Sixth and seventh	Session 4: Reviewing the past homework, retrieving the symptom identification plan and reviewing each of the five stages of the plan with the child, reviewing the relaxation plan (body relaxation training), presenting a reward (score), presenting homework
Eighth and ninth	Session 5: Reviewing the past homework, expressing collaboration, teaching sketches by child charts, reviewing the relaxation plan (body relaxation training), presenting a reward (score), presenting homework
Tenth and eleventh	Session 6: Reviewing the past homework, Identify child's diagnosis and judgment, role playing, relaxation (body relaxation training), presenting a reward (score), presenting homework
Twelfth and thirteenth	Session 7: Reviewing the past homework, emotional reaction and awareness of physical cognition symptoms and anger, plan to ignore some obstacles and problems (reaction to plan), choose and run the best plan, reviewing the relaxation plan (body relaxation training), presenting a reward (score), presenting homework
Fourteenth	Session 8: Reviewing the past homework, reviewing the emotion recognition plan (anger, happiness and sadness, etc.), reviewing the relaxation plan (body relaxation training), presenting rewards (score), presenting homework

Hassanabadi et al. cognitive-behavioral training program for hyperactivity syndrome was 60 minutes in 14 sessions (2012).

Procedure

In this research, after getting a research consent and obtaining a list of names of preschool centers from the Education Department of Meshgin Shahr city, by cluster sampling method from 105 classes with a total population of 2102 people (1104 boys and 998 girls), 30 classes were randomly selected in the academic year 1397-1398. After explaining the purpose of the research and how to answer the questions and motivate responders to answer the questionnaire items correctly and encrypt the children's information for ethical principles and confidentiality of the research results, all data about the pre-test were collected using Conners Teacher and Parent Rating Scales. To identify children with ADHD by screening children in the population, those children who had ADHD based on parent and teacher points of view on the research scale (a standard deviation above average), 30 children as a sample were randomly assigned into experimental (n = 15) group and a control (n = 15) group. Then, the cognitive-behavioral training program of Hassanabadi et al. (2012) for hyperactivity syndrome was taught in 14 sessions on 60 minutes for the experimental group after the training sessions. Post-test was taken by both groups and the necessary data was collected. Then, the collected data were analyzed by multivariate analysis of covariance using SPSS software, Ver. 22.

Result

Research descriptive results of the hyperactivity dimensions from parents and teachers point of view are presented in Tables 2 and 3.

Table 2. Statistical sample's description of ADHD based on parents' points of view in pretest posttest

ADHD	Number	Group	Mean	Standard deviation
Pre-Test - Attention Deficit/Memory Problem	15	Experimental	9.06	2.02
	15	Control	8.80	2.24
Post-Test - Attention Deficit/Memory Problem	15	Experimental	7.80	2.27
	15	Control	9.00	1.77
Pre-test - Restlessness/hyperactivity	15	Experimental	9.60	1.12
	15	Control	9.53	2.61
Post-test - Restlessness/hyperactivity	15	Experimental	8.80	1.37
	15	Control	9.73	2.79
Pre-test - Impulsivity	15	Experimental	9.06	1.16
	15	Control	9.00	2.48
Post-test - Impulsivity	15	Experimental	8.83	1.23
	15	Control	9.13	2.45
Pre-test - difficulty in self-concept	15	Experimental	9.53	1.68
	15	Control	8.73	2.28
Pre-test - difficulty in self-concept	15	Experimental	8.33	1.63
	15	Control	8.60	2.09
Pre-test - Total hyperactivity score (parents)	15	Experimental	37.26	3.37
	15	Control	36.06	2.68
Post-test - Total hyperactivity score (parents)	15	Experimental	33.26	4.28
	15	Control	36.00	2.59

The results of table (2) show that from the parents' point of view, in general, experimental group's hyperactivity dimensions in the post-test stage decreased, while there was no significant change in the control group. According to the parents point of view, the average score of hyperactivity for the experimental group in the pre-test stage is 37.26 with a standard deviation 3.37, while in the post-test stage, it is equal to 33.26 with a standard deviation 4.28. And for control group, from the parents point of view, the average score of hyperactivity in the pre-test stage is 36.06 with a standard deviation 2.68, while in the post-test stage, it is equal to 36 with a standard deviation 2.59.

Table 3. Sample description of ADHD based on teachers' point of view in pretest posttest

ADHD	Number	Group	Mean	Standard deviation
Pre-Test – Child's behavior at school	15	Experimental	38.13	2.32
	15	Control	38.60	2.67
Post-Test – Child's behavior at school	15	Experimental	35.13	3.27
	15	Control	86/35	2.75
Pre-test - Participation and Group cooperation	15	Experimental	15.33	1.80
	15	Control	14.06	2.05
Post-test - Participation and Group cooperation	15	Experimental	13.93	2.96
	15	Control	14.13	1.60
Pre-test - Attitude towards authorities	15	Experimental	16.20	2.33
	15	Control	17.00	2.72
Post-test - Attitude towards authorities	15	Experimental	14.53	3.04
	15	Control	16.86	2.32
Pre-test - Total hyperactivity score (teachers)	15	Experimental	69.66	4.05
	15	Control	69.66	3.96
Post-test - Total hyperactivity score (teachers)	15	Experimental	63.60	6.30
	15	Control	69.86	3.92

The results of Table 3 show that from the preschool teachers' point of view, in general, experimental group's hyperactivity dimensions in the post-test stage decreased, while there was no significant change in the control group. According to the teachers' point of view, the average score of hyperactivities for the experimental group in the pre-test stage was 69.66 with a standard deviation of 4.05, while in the post-test stage, it was equal to 63.60 with a standard deviation of 6.30. For control group, from the teachers' point of view, the average score of hyperactivity in the pre-test stage was 69.66 with a standard deviation of 3.96, while in the post-test stage, it was equal to 69.86 with a standard deviation of 3.92.

Covariance test was used to evaluate the effect of cognitive-behavioral strategies training on reducing the symptoms of hyperactivity syndrome in preschool children from the parents'/teachers' point of views which results are in follows. Also, research variables normal

distribute in statistical groups during pre-test and post-test was confirmed by Shapiro-Wilkes test.

Table 4. Multivariate analysis of covariance significant tests result (parents' point of view)

-	Tests	Value	F	Sig.	Partial eta squared
Pre-test Group	Pillai's Trace	0.74	2.82	0.008	0.37
	Wilks' Lambda	0.27	4.19	0.000	0.47
	Hotelling's Trace	2.60	5.72	0.000	0.56
	Roy's Largest Root	2.60	12.37	0.000	0.72

According to Table 4, the significance level of all tests allows to use multivariate analysis of covariance ($p < .05$) and 37% to 72% of the percentage of variance is related to the difference between two groups due to the interaction between the dependent variables.

Table 5. Levine's test - evaluate variance of hyperactivity between experimental & control groups (parents' view)

Variables	F (1, 28)	Sig
Attention Deficit / Memory Problem	0.001	0.976
Restlessness / hyperactivity	1.236	0.113
Impulsivity	3.933	0.084
Difficulty in self-concept	0.762	0.390
Total hyperactivity score	1.499	0.110

The significance level of variables is more than "0.05" and the assumption of homogeneity of variances in the above variables in two groups is confirmed.

Table 6. Results of multivariate analysis of covariance based on parents' point of view

Origin -		Sum of squares	DF	Mean of squares	F - Value	Sig.	Partial eta squared
Group	Attention Deficit / Memory Problem	25.62	2	12.81	3.40	0.048	0.201
	Restlessness / hyperactivity	5.27	2	2.26	0.52	0.600	0.037
	Impulsivity	39.03	2	19.52	7.44	0.003	0.355
	difficulty in self-concept	18.34	2	9.17	3.05	0.064	0.184
	Total hyperactivity score	288.54	2	256.19	30.65	0.000	0.694

According to parents' point of view, there is a significant difference between the participants in pre-test and post-test in the mean of attention deficit/memory problem ($F=3.405$; $P= 0.048 < .05$); impulsivity ($F = 7.440$; $P = 0.003 < .05$) and the total hyperactivity score ($F = 30.657$; $P = 0.000 < .05$). On the other hand, based on the results, it can be said that there was no significant difference between experimental and control groups in restlessness/hyperactivity and difficulty in self-concept ($p > .05$).

Table 4. Multivariate analysis of covariance significant tests result (teachers' point of view)

-	Tests	Value	F	Sig.	Partial eta squared
Pre-test Group	Pillai's Trace	0.77	5.41	0.000	0.384
	Wilks' Lambda	0.27	7.59	0.000	0.477
	Hotelling's Trace	2.49	9.98	0.000	0.555
	Roy's Largest Root	2.43	21.06	0.000	0.708

According to Table 7, the significance level of all tests allows to use multivariate analysis of covariance ($p < .05$) and 38.4% to 70.8% of the percentage of variance is related to the difference between two groups due to the interaction between the dependent variables.

Table 5. Levine's test - evaluate variance of hyperactivity between experimental & control groups (teachers' view)

Variables	F - Value	DF (1)	DF (2)	Sig.
Child's behavior at school	0.05	1	28	0.827
Participation and Group cooperation	3.57	1	28	0.075
Attitude towards authorities	0.46	1	28	0.502
Total hyperactivity score	3.24	1	28	0.083

The significance level of variables is more than "0.05" and the assumption of homogeneity of variances in the above variables in two groups is confirmed.

Table 6. Results of multivariate analysis of covariance for first hypothesis (teachers' point of view)

Origin -		Sum of squares	DF	Mean of squares	F Value	Sig.	Partial eta squared
Pre-test Group	Child's behavior at school	179.92	2	80.96	13.49	0.000	0.500
	Participation and Group cooperation	4.18	2	2.09	0.36	0.698	0.026
	Attitude towards authorities	143.20	2	71.60	18.75	0.000	0.581
	Total hyperactivity score	723.25	2	361.63	28.50	0.000	0.679

According to teachers' point of view, there is a significant difference between the participants in pre-test and post-test in the mean of children's behavior at school ($F = 13.49$; $P = 0.000 < .05$); attitude towards authorities ($F = 18.75$; $P = 0.000 < .05$) and the total hyperactivity score ($F = 361.63$; $P = 0.000 < .05$). On the other hand, based on the results, it can be said that there was no significant difference between experimental and control groups in participation and group cooperation ($p > .05$).

Discussion

The results showed that there is a significant difference between preschool children in the experimental group and the control group in terms of ADHD symptoms. Also, the results of cognitive-behavioral strategies training indicated a significant difference between the rates of ADHD syndromes. In other words, cognitive-behavioral strategies training reduces the symptoms of hyperactivity according to the average rate of hyperactivity in children before the training compared to the average rate of hyperactivity in preschool children at the end of the course. According to the teachers' point of view on "Children's behavior at school; Attitude towards authorities and total hyperactivity score and parents' point of view on "Attention deficit/Memory Problem; Impulsivity; Total Hyperactivity Score", this statistically significant decrease in ADHD, is because of cognitive-behavioral strategic training, but "Participation and Group cooperation" from teachers' point of view and "Restlessness/hyperactivity" and "Difficulty in self-concept" from the parents' point of view in the end of training period had not significantly changed.

To explain the effect of cognitive-behavioral strategies on reducing the symptoms of ADHD in preschool children from the educators' perspective, it can be stated cognitive-behavioral strategy with positive and negative reinforces, shaping, modeling, proximity, deprivation and extinguishing methods and other treatment methods used in the classroom lead to improved attention and control the behavioral problems in children with ADHD. Also, it helps the child to improve his/her cooperation in school and avoid unnecessary excitement and making weird noises, also to finish what he/she starts, generally improve the child's behavior in school, because teaching these kinds of behaviors and practicing them in social environments and operant conditioning techniques, reinforcement-based dependence and combining them with social skills training and behavioral management techniques leads to improved attention and regulation of impulses in children with ADHD. Children become more obedient and they avoid arrogance and inappropriate protest. In expressing their demands and needs from teachers and mentors, they put shame and fear aside and in general their attitudes towards the authorities change. Also, to explain the effect of cognitive-behavioral strategies on reducing the ADHD symptoms in preschool children from the parents' perspective, it can be stated that cognitive-behavioral strategy training can improve and regulate children' behaviors and achieve long-time changes in behavior. Therefore, when children interact and are trained by this technique, it leads to the correction and improvement of impulse control, problem solving, and self-control. According to the results, an intervention approach to educating children is effective in dealing with academic and non-academic problems, whether at school, at home or in other environments. So, it increases the rating of occupation and completing homework, the time of focus and attention to tasks, the child's performance at home and reduces their distractive behavior and generally improves inattention, distraction and memory problem.

About the effect of this training on impulsivity (emotional instability), it can also be said that this intervention method uses behavioral analysis methods including dependency-based approach and cognitive-based approach, in which it teaches children different mediation strategies. Dependency-based approaches consider the consequences of behavior, but cognitive-based approaches focus on outcomes of behavior. Therefore, the effective technique in this approach is based on self-control and the child can experience less impulsivity in a way that increases child's attention and concentration and he/she becomes less distracted.

Conclusion

Due to the fact that this research is the first of its kind, the results of previous studies are in line with the results of this research. For example, Hesslinger et al. (2002) has shown that cognitive-behavioral therapy is more effective in adults than children. Adults' motivation for treatment, children's poor cognitive abilities, and less acute adult symptoms are some of the factors that can justify this. Similar to this, Hirvikoski et al. (2011) concluded that skills-based cognitive-behavioral group therapy could alleviate ADHD symptoms. Also, Zoghipaidar et al. (2016) believe that the parents of normal children use the instrumental method more in interaction with their children and the parents of children with ADHD use the control method more. In addition, Amiri (2015) in a similar study found that behavioral education strategies for mothers reduce behavioral problems and ADHD symptoms in children; therefore, by educating parents, the symptoms of attention deficit/hyperactivity disorder can be managed. Hassani et al. (2013) in a study measured the effect of play therapy based on cognitive-behavioral approach on anxiety and self-esteem of children with

ADHD. They found that play therapy significantly increases self-esteem in children with ADHD, however, this treatment did not significantly reduce the anxiety symptoms of children with ADHD. The researchers did not check the effect of play therapy based on cognitive-behavioral on reducing ADHD. Hassanabadi et al. (2012) measured and compared the effect of two methods, drug therapy and cognitive-behavioral therapy, on the line with this study result, cognitive-behavioral strategies in reducing attention deficit/hyperactivity disorder was more effective and appropriate. Also, the result of this research was in line with the results of the research by Rahbar Karbasdehi et al. (2017), Mohammadi et al. (2018), Oortmerssen et al. (2019) and Risley et al. (2020). But, it was inconsistent with the results of a research by DuPaul et al. (2016).

The present study has some limitations which include lack of follow-up in order to evaluate the effect of the training methods for a long-term effect. Also, the subjects of the present study were only preschool children, so the generalizability of the results should be done with caution. This research is suggested to be reviewed in other groups and by holding cognitive-behavioral training workshops for parents and teachers. In addition, concurrent training for teachers on the symptoms of ADHD can identify and treat these disorders in younger age

Disclosure statement

No potential conflict of interest was reported by the authors

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