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Barkley behavioral therapy, Minuchin structural family therapy, and neurofeedback effect on children with attention-deficit/hyperactivity disorder

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Original Article

Abstract

BACKGROUND: This study aimed to compare some types of behavioral and family therapy on children suffering from attention-deficit/hyperactivity disorder (ADHD).

METHODS: The population in this research consisted of all students in a primary school located in Karaj City, Iran, in 2019. Forty (10 for each group) students and their mothers participated. Available samples were randomly selected for each group. A semi-structured diagnostic interview [Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS)], the short diagnostic scale for hyperactivity and attention deficit disorder, and the Multidimensional Anxiety Scale for Children were used to obtain information. Barkley behavioral therapy (9 sessions of 90 minutes), Minuchin structural family therapy (8 sessions of 90 minutes), and neurofeedback (25 sessions of 30 minutes) were performed on the experimental groups. There were no therapies in the control group. SPSS software along with multivariate analysis of covariance (MANCOVA) and dependent t-test were performed for data analysis.

RESULTS: All three treatment methods had a significant role in anxiety ($P < 0.05$). Post-hoc test revealed that there was a significant difference between therapies on the anxiety of the experiment and control groups ($P < 0.05$). Three-month follow-up showed the resistance to therapies ($P > 0.05$).

CONCLUSION: Behavioral and family therapy had a prominent and positive role in the reduction of anxiety among children suffering from ADHD.

KEYWORDS: Barkley Behavioral Therapy; Minuchin Structural Family Therapy; Neurofeedback; Attention-Deficit/Hyperactivity Disorder

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Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a mental disorder characterized by a pattern of attention problems or impulsive hyperactivity disorder that causes clinically significant impairments in occupational, academic, and social functions.[1] Research has shown that drug stimulants have been effective in reducing ADHD-related symptoms in many children.[2] Despite this effectiveness, drug treatment often has intolerable side effects and short-term negative consequences for children such as headache, anorexia, insomnia, and long-term consequences such as slow growth in children.[3] It usually recurs with the end of behavioral or pharmacological

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treatments.[4] Therefore, identifying effective non-pharmacological approaches for people with ADHD is essential. Various treatments have been introduced to reduce ADHD. These methods are generally classified under two categories: pharmacological and psychosocial. There is a link between poor family functioning and ADHD-related problems.[5-8]

Barnard-Brak et al. showed that parental education programs reduced the underlying symptoms of ADHD, and they also reduced children's behavioral problems.[9] Antshel and Barkley reported that behavior therapy was an intervention that had been empirically supported by children with ADHD. In this regard, one of the treatments based on the interaction of parents with children with ADHD is Barkley behavioral intervention. Parental behavioral education emphasizes the antecedents that provide parents with positive reinforcement for their child's social behavior. One of the benefits of parental behavioral therapy is a better fit between parent-child interactions in the social context and after-school activities.[10] Another family-based treatment for ADHD is structural family therapy. The main idea of structural family therapy is that the individual's symptom is better understood when evaluated in the context of family interactive patterns.[11,12] Varghese et al. showed that emphasis on the family as a whole and interactions between family subsystems were the most important performance criteria; a healthy and functional subsystem has clear boundaries based on the plans, rules, and power with which structural family therapy works.[13] Neurofeedback has the potential to be effective in reducing ADHD by modulating mental activity in children with ADHD and comorbid disorders such as autism.[14-16] Arns et al. proved the positive effectiveness of neurofeedback on ADHD.[17]

In the present study, the researcher intends to determine the best type of treatment for ADHD/anxiety through semi-experimental research. Therefore, the main purpose of this study was to compare the effects of Barkley behavioral therapy, Minuchin structural family therapy, and neurofeedback on anxiety in children with ADHD and the consistency of the results in the follow-up phase.

Methods

The method of the present study was quasi-experimental with pretest-posttest and a control group. The statistical population of this study was all primary school students in Karaj City, Iran, in 2019. First, using cluster random sampling, 400 of these students were selected and screened for hyperactivity and anxiety. 40 students with hyperactivity and anxiety were randomly selected and assigned to three experimental groups and one control group. The necessary permits to study and consent to participate were obtained in writing from the Education Department of Karaj City, parents, and students. Freely participating in the study, the anonymity of the questionnaire, and reporting the results anonymously were considered as other ethical considerations. First, a screening was performed by hyperactivity and anxiety tests, and then from the subjects who had a standard deviation (SD) above the mean in both anxiety and hyperactivity, four groups were selected and three groups were exposed to the independent variable and then the changes made as a result of the dependent variable were measured. Three months after the end of the intervention sessions, all four groups were measured again by the study variables under the title of follow-up study. A semi-structured diagnostic interview [Kiddie Schedule for Affective Disorders and Schizophrenia (K-SADS)] was used to diagnose ADHD. To assess the symptoms of the disorder, Conners' Adult ADHD Rating Scale-Self-Report form and subscale,[1,2] and Multidimensional Anxiety Scale for Children[11,12] were used.

The above-measuring instruments were distributed among the members of each of the four groups (mothers under Barkley

behavioral therapy, mothers under Minuchin structural family therapy, children with ADHD under neurofeedback training, and control group) in three stages of pre-test, post-test, and follow-up.

Barkley Behavioral Therapy: It was a training course that was presented to the parents of the experimental group in a group for 90 minutes during 9 sessions each week and was prepared according to the Barkley's training program for parents.[18] The content of the sessions included teaching positive relationships, providing positive reinforcement, using a behavioral chart, successful use of punishment, how to use tasks and commands, praising skills, ignoring skills, and deprivation skills.

Minuchin Structural Family Therapy: The intervention was performed in 8 sessions of 90 minutes based on the family protocol in the Minuchin treatment process.[14]

Neurofeedback: The neurofeedback training program was conducted in 25 sessions of 30 minutes (three sessions per week). Neurofeedback was conducted using the monopolar method and installing an active electrode to the point Fz (central part of the frontal lobe). The beta wave was amplified at the Fz point.

Data Analysis: In the descriptive statistics section, the mean, SD, minimum, and maximum scores were used. Post hoc test with minimal difference was used to analyze the hypotheses (Thesis code: 11101123262521).

Results

The F value of the effect of Barkley's behavioral therapy on the variables of separation anxiety (4.727) and injury avoidance (8.617) was significant (P < 0.05). The value of F in the effect of Minochin structural family therapy on the overall score of anxiety (6.559) and the components of social anxiety (9.166) and avoidance of injury (28.041) was significant (P < 0.05). F value of the effect of neurofeedback treatment on the overall score of anxiety (7.068) and components of social anxiety (8.990) and avoidance of injury (27.612) was significant (P < 0.05) (Table 1).

There was a significant difference between the general anxiety in patients undergoing Minuchin structural family therapy (P = 0.01), neurofeedback treatment (P < 0.01), and control. In addition, there was a significant difference between the social anxiety in patients with Barkley behavioral therapy (P = 0.02), neurofeedback treatment (P < 0.01), and control. There was also a significant difference between separation anxiety in Barkley behavioral therapy (P < 0.01) and control. In terms of avoiding damage, Barkley behavioral therapy (P < 0.01), Minuchin structural family therapy (P < 0.01), and neurofeedback treatment (P < 0.01) were significantly different from the control group (Table 2).

Table 1. The effect of the therapies on anxiety

Variable	Source	Barkley behavioral therapy			Minuchin structural family therapy			Neurofeedback effect		
		F	P	Effect size	F	P	Effect size	F	P	Effect size
General anxiety	Covariate	0.18	0.67	-	0.41	0.52	-	0.01	0.90	-
	Group	0.18	0.67	-	6.55	0.02**	0.33	4.40	0.01*	0.29
Social anxiety	Covariate	0.30	0.59	-	1.38	0.26	-	0.58	0.45	-
	Group	2.46	0.14	-	9.16	0.01**	0.41	6.12	< 0.01**	0.37
Separation anxiety	Covariate	16.93	< 0.01	-	664.06	< 0.01	-	4.53	0.04	-
	Group	4.72	0.04**	0.26	0.06	0.80	-	4.33	0.03*	0.24
Avoiding damage	Covariate	4.37	0.05	-	1.46	0.24	-	4.73	0.03	-
	Group	8.61	0.01**	0.39	28.04	< 0.01**	0.68	8.75	< 0.01**	0.45
Physical anxiety	Covariate	0.44	0.51	-	0.56	0.46	-	4.46	0.04	-
	Group	0.30	0.59	-	3.07	0.10	-	2.12	0.11	-

*P < 0.05; **P < 0.01

Table 2. Results of least significant difference (LSD) post hoc test for pairwise comparison of groups

Variable	Treatment	Comparison group	MD	SE	P
General anxiety		Treatment 2	8.41	3.89	0.03*
	Treatment 1	Treatment 3	10.38	4.02	0.01*
		Control	-4.72	4.27	0.27
		Treatment 1	-8.41	3.89	0.03*
	Treatment 2	Treatment 3	1.96	4.06	0.63
		Control	-13.14	4.93	0.01*
		Treatment 1	-10.38	4.09	0.01*
	Treatment 3	Treatment 2	-1.96	4.06	0.63
		Control	-15.11	4.65	< 0.01**
		Treatment 2	2.70	1.25	0.03*
	Treatment 1	Treatment 3	2.47	1.31	0.06
		Control	-3.32	1.37	0.02*
Social anxiety		Treatment 1	-2.70	1.25	0.03*
	Treatment 2	Treatment 3	-0.22	1.30	0.86
		Control	-6.03	1.58	< 0.01**
		Treatment 1	-2.47	1.31	0.06
	Treatment 3	Treatment 2	0.22	1.30	0.86
		Control	-5.80	1.49	< 0.01**
		Treatment 2	2.72	1.01	0.01*
	Treatment 1	Treatment 3	1.57	1.06	0.15
		Control	2.59	1.11	0.02*
Separation anxiety		Treatment 1	-2.72	1.01	0.01*
	Treatment 2	Treatment 3	-1.14	1.06	0.28
		Control	-0.12	1.28	0.92
		Treatment 1	-1.57	1.06	0.15
	Treatment 3	Treatment 2	1.14	1.06	0.28
		Control	1.02	1.21	0.40
		Treatment 2	2.26	1.33	0.10
	Treatment 1	Treatment 3	2.35	0.39	0.10
		Control	-5.27	1.46	< 0.01**
Avoiding damage		Treatment 1	-02.26	1.33	0.10
	Treatment 2	Treatment 3	0.09	1.38	0.94
		Control	-7.53	1.68	< 0.01**
		Treatment 1	-2.35	1.39	0.10
	Treatment 3	Treatment 2	-0.09	1.38	0.94
		Control	-7.62	1.59	< 0.01**
		Treatment 2	3.77	1.98	0.06
	Treatment 1	Treatment 3	4.90	2.08	0.06
		Control	1.48	2.17	0.50
Physical anxiety		Treatment 2	-3.77	1.98	0.06
	Treatment 2	Treatment 3	1.12	2.07	0.59
		Control	-2.29	2.51	0.36
		Treatment 1	-4.90	2.08	0.06
	Treatment 3	Treatment 2	-1.12	2.07	0.59
		Control	-3.41	2.37	0.16

*P < 0.05; **P < 0.01

Treatment 1: Barkley behavioral therapy; Treatment 2: Minuchin structural family therapy; Treatment 3: Neurofeedback treatment; MD: Mean difference; SE: Standard error

Discussion

This research aimed to test Barkley's behavioral therapy, Minuchin structural family therapy, and neurofeedback effect on children with ADHD. The results of the present study showed that Barkley's behavioral therapy had

a significant effect on avoiding injury and separation anxiety in children with ADHD. Changes were also observed in other components related to anxiety and its overall score, but these changes were not statistically significant. Explaining this finding, it can be said that Barkley's behavioral therapy involves caregivers and parents, especially mothers, in educational programs and teaches them methods that can change the type of interactions they have with children.[20] For this reason, parental behavioral management training is effective in reducing the clinical symptoms of anxiety in children. The findings of this study show that mothers' behavioral management training method can be used by teaching appropriate interactive methods between parents and children, on the one hand, to alleviate their worries about separation anxiety and, on the other hand, to teach children the techniques of courage. After treatment sessions and education for mothers, the level of children's anxiety in separation anxiety and injury avoidance as well as the score in the post-test decreases.[21,22] The results of this study showed that structural family therapy had a significant effect on anxiety in children with ADHD. Mothers of children with emotional problems have less warm and intimate relationships with their children. As a result, the quality of parental attachment is negatively correlated with externalized behavioral problems such as theft, drug use and delinquency, aggressive behavior, and high-risk behavior, as well as internalized behavioral problems such as anxiety and depressed mood.[23] One of the basic assumptions of structural family therapy, as one of the most common approaches to family therapy, is that children's problems indicate the existence of problems in family interaction patterns, and therefore, in the treatment of children's disorders, emphasis is placed on changing specific interaction patterns. The findings of this study showed that through the structural family therapy model, parents were provided with the ability to properly recognize and express their thoughts and emotions and understand the thoughts, expectations, and emotions of their children; therefore, a significant reduction in children's anxiety was observed.[24] Moreover, the findings of the present study showed that neurofeedback had a significant effect on reducing anxiety in children with ADHD. Neurofeedback can help the brain reduce abnormal waves and increase desirable waves through training the brain and the principles of factor conditioning. Overall, it corrects abnormal patterns of brain function. It is maximized when the person is awake and relatively relaxed, and neurofeedback can help improve anxiety symptoms by regulating these waves. In addition, treatment that has fewer side effects is an issue that has always been of interest to therapists. Compared to treatments such as pharmacotherapy, neurofeedback intervention is learning without side effects and is a non-invasive procedure in which no input enters the brain. Compared to other treatments, the positive results of this treatment remain over time and there is no relapse. Neurofeedback can help a person safely control their psychological state and gain the ability to deal with anxious thoughts during daily life.[26] The reason for the effectiveness of neurofeedback training in reducing anxiety symptoms in children with ADHD is the effect of this method on the level of electrical function of the brain; the validity of this claim requires the results of further research to be done in the future. In neurofeedback training, the subject learns that he or she is the source of change, and this can extend the subject's confidence to lateral ranges as well. In the group in which mothers underwent Minuchin structural family therapy, the behavioral problems of children with ADHD as well as their anxiety improved significantly by improving family members' interactions. However, short-term changes

cannot be a criterion for judging a treatment to be effective. Therefore, paying attention to the durability and stability of the obtained results is more important than short-term changes. Regarding the stability of neurofeedback results during the follow-up phase, it should be said that neurofeedback training changes the way the brain works, and once this skill is learned, its effect seems to be continuous (unlike medication). Follow-up studies show long-term changes in brain function following neurofeedback training. In this study, the desired samples were limited to one place; thus, it is better to take samples from several centers and several cities to make better comparisons. Besides, it is necessary to investigate the effects of various drugs received along with psychological methods.

Conclusion

Neurofeedback teaches the brain the skill of regulating activity, and this skill is not forgotten like any other skill (such as driving). In the follow-up stage, which lasted for three months after the end of the training sessions, the results obtained for Barkley's behavioral therapy and Minuchin structural family therapy were the same and all showed that they could make long-term changes in the anxiety of children with ADHD. Therefore, the use of these therapies can be considered as one of the goals of educating exceptional children.

Conflict of Interests

Authors have no conflict of interests.

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