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Research paper

The Effect of Multidisciplinary Intervention at Different Levels of Children, Parents, and Peers on Improving Working Memory of Children with Attention Deficit / Hyperactivity Disorder

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Abstract

The aim of this study was to determine the effectiveness of multidimensional intervention in three levels of executive functions training to Children with Attention Deficit /Hyperactivity Disorder, communication skills to peers, and behavior change strategies to parents on Working Memory. The research method was quasi-experimental with pre- post-test stages. The statistical population of the study was all 6- 9 years old boys with ADHD, in Kermanshah in the academic year of 2019. By cluster sampling method,30 ADHD students were selected, randomly, divided into two groups of 15 people. Also, their parents and peer students were in different training programs. Data were analyzed using analysis of covariance. The results showed that integrated multidisciplinary education improved working memory and retention but had no significant effect on their processing. It is suggested that in the treatment of children with ADHD, multifaceted methods be used.

Keywords: Behavior change of parents, working memory, executive functions, communication skills with peers, attention deficit /hyperactivity disorder

Introduction

Attention Deficit /Hyperactivity Disorder, ADHD, is a neurodevelopmental disorder that affects approximately 8-12% of children worldwide (Luo, et al., 2019). Despite the many studies that have been done over the past few decades on the etiology and explanation of this disorder, so far no single risk factor for ADHD has been identified (Luo, et al., 2019). One of the areas of interest in recent years is the pattern of failure in executive functions. Dentz, et al., (2020) showed that working memory training is effective on the symptoms of ADHD. Another intervention for ADHD is parent education. Some researchers have considered the most effective elements of parenting education to be the use of deprivation instead of deprivation, stability in laws and attitudes, and teaching child-parent interaction and creating self-control in the child (Chesterfield, et al., 2020). On the other hand, the demonstrations of hyperactivity and attention deficit are not separate from the lack of social skills. Therefore, the use of approaches that can help the child's social space and increase their communication relationships has been considered by researchers (Batson, et al., 2017). However, so far no research has been found that simultaneously covers the dimensions of child, parent and peer education. Therefore,

the aim of this study was to investigate the effect of multidimensional intervention at different levels of children, parents, and peers on improving the working memory of children with ADHD.

Method

The method of this research was quasi-experimental with an experimental and a control groups. The statistical population of the study was all 6 to 9 years old boys with symptoms of ADHD, in Kermanshah in the academic year of 2019. Random cluster sampling method was used. After introducing students suspected of ADHD by the teacher, these students were examined both by examining and confirming the symptoms according to the fifth and fourth editions of the Diagnostic and Statistical Manual of Mental Disorders as well as by a psychiatrist. Then the parents of these students were invited to explain the process and get consent. From the parents who agreed, 30 families were randomly selected. Finally, the selected individuals were divided into two groups of 15 people. To select peer samples, the classes of the children assigned to the experimental group were identified and from each class, on the teacher's recommendation, 3 to 5 peers who were friends with the experimental group students were introduced and then one or two of them were randomly selected. In the experimental group with disorder, the executive functions training program (Asgari et al., 2014) and for normal peer children, communication skills training (Khanzade, 2008) and for parents, learning to change parenting and communication behaviors was performed. The instruments used in this study were Working Memory Software**,** (Daneman & Carpenter, 1980). This software consists of 27 sentences and measures processing and retention. Finally, the score of the processing section is added to the score of the retention section and the result is divided by two to get the total score. In the present study, the reliability of this test was 0.73 using Cronbach's alpha method.

Results

Descriptive findings of working memory variable in the two groups and in two stages of pre-test and post-test are reported in Table 1.

Table 1. Description of subjects' scores on working memory variable in the two groups studied in pre-test and post-test

Variables	Group	No. gp.	Pre-test mean	Standard deviation	Post-test mean	Standard deviation
Processing	experiment	15	48.38	9.15	57.29	11.72
	control	15	51.18	6.68	51.12	11.07
Retention	experiment	15	15.04	5.49	42.45	15.72
	control	15	17.26	6.94	15.78	6.77
Total working memory	experiment	15	31.74	5.97	49.86	11.80
	control	15	34.18	4.08	33.44	6

In order to perform the covariance test, the assumptions of the normality of the distribution of variables from the skew and elongation indices (-2 and +2) and homogeneity of variances (F= 0.07, p>0.05, BOX=10.73) Levin test was used in pre-test and post-test. One-way univariate analysis of covariance was used to investigate the effect of multidimensional intervention on the improvement of total working memory and retention and processing subscales. Also, interaction analysis of variance was used to investigate the default of non-interaction of the pre-test with the independent variable on the dependent variable. In Table 2, the results of one-way analysis of covariance are reported to investigate the differences between the experimental and control groups in the active memory post-test and the processing and retention subscales with the pre-test control of this variable.

Table 2. Results of one-way analysis of covariance between two groups in total working memory and processing and retention subscales

Variables	SS	df	MS	F	P	Es
Total working memory	1838.89	1	1838.89	20.29	0.001	0.43
Processing	317.37	1	317.37	2.43	0.13	0.08
Retention	4685.17	1	4685.17	31.07	0.001	0.54

According to Table 2, the total working memory with F (1,20.29) in the post-test, is significant at the level of 0.001. The F-statistic is also significant (p<0.01) for the retention component (31.07). These findings show that there are significant differences between the experimental and control groups in the total working memory as well as the retention component. The effect size of 0.43 for the working memory and 0.54 for the retention show that these differences are large and significant in the society. But, the F-statistic is not significant (p>0.05) for the processing component (2.43). This finding shows that there is no significant difference between the experimental and control groups in the processing component.

Discussion

The results showed that integrated multidisciplinary education improved working memory and retention, but had no significant effect on their processing. In analyzing the results, we can say executive-based training leads to increased mental inhibition, procrastination, flexibility, and ultimately increased decision-making and problem-solving power. In addition, parenting skills training provides a good framework for the child's behaviors, which in turn leads to increased self-restraint skills and other executive functions such as working memory. And also, educating the peers of these children can increase their communication and problem-solving skills. In conclusion, creating the right context through family and peer education and the simultaneous teaching of executive functions has contributed to the effectiveness of this integration. Based on the results of this study, it is suggested that in the treatment of children with ADHD, multifaceted methods be used with emphasis on different levels of parents and peers.

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Conflicts of interest

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