

Investigating the Effectiveness of the Rehabilitation Program Based on Executive Functions on Processing speed and Attention of Children with Autism Spectrum Disorder

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Abstract

The aim of the present study was to investigate the effectiveness of the rehabilitation program on processing speed and attention of children with autism spectrum disorder. This research was semi-experimental with a pre-test, post-test, control group and follow-up design. A sampling of 20 children were selected by purposive sampling and randomly divided into control and experimental groups. The experimental group received 20 sessions of 30 mins cognitive rehabilitation intervention, twice per week. Integrated Visual and Auditory Continues Performance was used to collect data in three stages (before, after and two months later after the implementation of the cognitive rehabilitation program). The data analyses were done by repeated measurement test. The result showed that the cognitive rehabilitation program had effect on the processing speed and attention of students with autism spectrum disorder.

Keywords: attention, autism spectrum disorder, cognitive rehabilitation, processing speed

Introduction

Autism spectrum disorder (ASD) is a type of neurodevelopmental disorder that is characterized by persistent and pervasive deficits in communication and social interaction and the presence of repetitive behavior (American Psychiatric Association, 2022). Children with autism spectrum disorder are impaired in Executive functions (Chen, et al., 2019). Executive functions refer to a neuropsychological concept that include high-level cognitive processes for planning and purposeful activity. Here is promising evidence that executive functions play an important role in children' academic performance (Ameis, et al., 2022). Based on research, poor academic performance is often associated with weakness in cognitive abilities, including executive functions (Macoun, 2020). One of the areas of executive functions of children with autism spectrum disorder which is impaired is the difficulty in maintaining attention or sustained

attention. Sustained attention involves sustained processes of focused attention that last over a period of time (Caplan, et al., 2018). Processing speed is related to attention, and the research shows that autistic children have serious deficits in attention, and because the speed processing of information requires attention, it can be concluded that these children also perform poorly in the processing speed too. Cognitive rehabilitation (CR) is a way for improving executive functions. Cognitive rehabilitation, which is used to treat and rehabilitate cognitive problems, refers to training that is based on the findings of cognitive science and tries to improve or enhance executive functions, these abilities refer to the brain flexibility (Wiest, et al., 2020). The available results show that cognitive rehabilitation with practical exercises that target neuropsychological functions has a positive effect on the improvement of cognitive deficits. Therefore, the hypothesis of the current research is that the rehabilitation program based on executive functions has an effect on the speed of processing and attention of children with autism spectrum.

Method

This research was semi-experimental with a pre-test, post-test and control group and follow-up. Among the autistic children in one of the special schools for autism spectrum disorder in Tehran, 20 children were selected and then these participants were randomly divided into 2 experimental and control groups. Before the implementation of the intervention sessions, a meeting was held for the parents and their consent to participate in the program was obtained, then the pre-test was performed for both groups. In this research, the cognitive rehabilitation program (Qhasemi, et al., 2018) was used. This program was in the form of computer software and consists of a series of games with the aim of improving executive functions (cognitive flexibility, processing speed and attention). The mentioned rehabilitation program was implemented in 20 sessions of 20-30 minutes and twice a week for children with autism spectrum. After the sessions completed and two months later, the post-test was taken. The data were analyzed using the repeated measurement method in SPSS.

Tool

Integrated Visual and Auditory Continues Performance (IVA): The purpose of the test is to measure the maintenance or continuity of attention. Research using IVA-2 for children aged 7 to 12 years report a sensitivity of 92% in identifying people with attention deficit hyperactivity disorder. The Persian version of this test has a reliability coefficient of 0.53 to 0.93. To perform the test. In the present study, the Cronbach's alpha coefficient for the entire scale was 0.70.

Results

In the experimental group, 30% were 13 years old and 30% of the children were studying in the fifth grade while in the control group 30% were 11 years old and 30% of the children were studying in the third grade. The mean and standard deviation of age in the experimental group were 11.40, 1.42, and in the control group, 10.80 and 1.31.

Table 1 shows the descriptive of research variables in two groups.

Table 1. Descriptive findings of research variables in the experimental and control groups

Variable	Group	Stage	Mean	SD
Processing speed	Experimental	Pre-test	620.40	8017.60
		Post-test	592.80	7892.84
		Follow up	593.50	7870.72
	Control	Pre-test	620.30	8078.90
		Post-test	624.30	9889.34
		Follow up	619.20	8931.06
Attention	Experimental	Pre-test	55.30	53.56
		Post-test	62.30	41.34
		Follow up	61.10	42.76
	Control	Pre-test	54.60	56.71
		Post-test	54.70	53.34
		Follow up	54.20	39.51

The homogeneity of variance-covariance matrices has been correctly proved by Mbox test for processing speed and attention, which showed it is not significant for both groups($\alpha=0.05$). According to the table 2, obtained F from the variables of processing speed and attention in the two experimental and control groups, being not significant at the $\alpha =0.01$ level, it can be stated that there is a significant difference between the research variables in the groups The result has shown the effectiveness of the cognitive rehabilitation program.

Table 2. Tests of inter subject effects of research variables

variable	Source	sum	df	Average of squares	F	P
Processing Speed	group	3697.35	1	3697.35	0.11	0.743
	error	1753.06	18	97.39		
Attention	group	385.06	1	382.06	2.75	0.115
	error	2520.86	18	140.04		

Discussion and Conclusion

The obtained result can be explained by brain flexibility which can regain its lost function by restoring itself. In the process of brain recovery, other areas gradually take over the duties of the damaged parts and new neural pathways are formed. In this research, the games that are associated with improving the speed of processing and attention in these children, the time factor was considered important in increasing processing speed and attention. Because the child must reach the target in the defined time period, otherwise he would lose the game. The use of immediate reinforcements as well as the attractive appearance of the game encouraged the child

to look for the target stimulus quickly. With the success of the child in each stage of the game, the characteristics of the target stimulus got more complicated and the time to find it decreased. Computer-based cognitive rehabilitation can be one of the appropriate methods for training and improving the executive functions of children with autism spectrum in the childhood. These features of the rehabilitation program used in improving the ability of processing speed were effective.

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Conflicts of interest

Authors found no conflict of interests.



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