

## Effect of Cognitive Rehabilitation Program on Prospective and Retrospective Memory in Students with Hearing Impairment

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### Abstract

The purpose of this research was to investigate the effectiveness of the cognitive rehabilitation program on prospective and retrospective memory in students with hearing impairment. The present research was a semi-experimental study with pre-test, post-test design and control group. The statistical population of the study consisted of students with hearing impairment in Isfahan city. Participants were 26 girl students with hearing impairment from Mir Deaf School using convenient sampling method. They were divided into experimental and control groups, each group consisting of 13 children. The experimental group received cognitive rehabilitation program in 10 sessions, while control group kept in a waiting-list. The instrument was Prospective and Retrospective Memory Questionnaire. The data were analyzed using MANCOVA. The results revealed that cognitive rehabilitation program improved prospective and retrospective memory of students with hearing impairment. So, planning for providing of cognitive rehabilitation program for them has particular importance.

**Keywords:** Cognitive rehabilitation, hearing impairment, prospective memory, retrospective memory

### Introduction

Deaf and hard of hearing students or students with hearing impairments are one of the groups of students with special needs (Ashori, et al., 2018). According to the World Health Organization, about 5 percent of people in the community have hearing loss (Zhang, et al., 2019). Children with hearing loss experience more linguistic and cognitive problems than their normal peers and have more memory problems (Cupples, et al., 2018). In general, prospective and retrospective memory are two important areas that are affected by hearing loss (Ferguson, et al., 2015).

Although retrospective memory is an important cognitive ability in remembering daily activities, individuals need other abilities called prospective memory to perform many tasks (Altgassen, et al., 2018). This type of memory is a reminder to take action in the future and its role is crucial in everyday life (Engle, 2018). Retrospective memory has three stages that included decoding, storage and retrieval, while prospective memory has five stages that included decoding, retain, retrieval, execution and evaluation (Meier, et al., 2017).

One of the effective programs to enhance memory is cognitive rehabilitation (Pérez-Martín, et al., 2017). Cognitive rehabilitation can directly and indirectly affect memory (Leding, 2019). For example, research findings of Castiglione, et al. (2016) indicated that the auditory rehabilitation had positive and significant effect on cognitive performance, attention and memory of deaf people. Research results of Ferguson, et al. (2015) showed that the auditory rehabilitation program improved attention and working memory of people with hearing impairment.

Therefore, the hypothesis of this research was to determine the effectiveness of the cognitive rehabilitation program on prospective and retrospective memory in students with hearing impairment.

## Method

The present research was a semi-experimental study with pre-test, post-test design and control group. The statistical population of the research consisted of students with hearing impairment in Isfahan city. The participants were 26 girl students with hearing impairment from Mir Deaf School using convenient sampling method. They were divided into experimental and control groups, each group consisting of 13 children. The inclusion criteria were being sensory-neural hearing loss, informed consent and willingness to participate in research. Participants would be excluded from this research if there was absence more than two sessions in training sessions, taking stimulant or non-stimulant drugs.

The importance of this study was described for mothers of participants. Students with hearing impairment assigned randomly into experimental and control groups. To assess prospective and retrospective memory of experimental and control group, Prospective and Retrospective Memory Questionnaire was used as pre-test. Crawford, et al. (2003) reported internal consistency of prospective memory; retrospective memory; and total score were 0.80, 0.84 and 0.89, respectively. Cronbach's alpha coefficient of this research has been reported for prospective memory; retrospective memory; and total score 0.73, 0.76 and 0.77, respectively.

In the later stage, experimental group participated in 10 sessions in the cognitive rehabilitation program (two sessions weekly; each lasts for 50 minutes), while the control group did not participate in this program and kept in a waiting-list. This program has been applied in the several research studies and was designed based on Sholberg and Mateer (2001). In the final stage of the research, each of the two groups was assessed by Prospective and Retrospective Memory Questionnaire as post-test. Data were analyzed by MANCOVA.

## Results

The mean of age in the experimental and control groups were 14.11 years (SD=0.63) and 14.09 years (SD=0.56), respectively. The mean and standard deviation of prospective and retrospective memory in experimental and control groups in pretest and posttest are shown in Table 1.

**Table 1.** Mean and standard deviation of research variables in experimental and control groups

variables	Situation	Experimental group	Control group
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		Mean	SD	Mean	SD
Prospective memory	Pre-test	43.23	0.62	42.34	0.64
	Post-test	36.15	0.59	42.11	0.81
Retrospective memory	Pre-test	39.27	0.88	40.30	0.49
	Post-test	31.14	0.63	39.19	0.72

The first, normality of variables and contingency of variance and covariance assumptions were tested. The Kolmogorov Smirnov test showed that all variables were normal ( $P > 0.05$ ). Also, Box test confirmed contingency of variance-covariance assumption. So, assumptions of MANCOVA test confirmed and can be used this test for analysis of data. The overall score Wilks' Lambda was significant, ( $F = 183.52, P = 0.0005$ ), indicating that experimental and control groups had significant difference, at least in one of the prospective and retrospective memory variables. In order to determine differences among scores of these variables between control and experimental groups, MANCOVA test was used. Its results are reported in table 2.

The results showed that cognitive rehabilitation program training had a significant effect on the prospective and retrospective memory in students with hearing impairment ( $P < 0.0005$ ). It can be said that pay attention to Eta square 59% and 62% of variations in variables such as prospective and retrospective memory, can be explained by the subjects' participation in cognitive rehabilitation program training.

**Table 2.** Summary of MANCOVA results

Depended variable	Source	SS	df	MS	F	Sig	$\eta^2$
prospective memory	Pre-test	67.71	1	67.71	1.81	0.26	0.13
	Group	436.45	1	436.45	63.07	0.0005	0.59
	Error	152.24	22	6.92			
	Total	720.93	25				
Retrospective memory	Pre-test	74.63	1	74.63	2.01	0.06	0.21
	Group	498.11	1	498.11	59.72	0.0005	0.62
	Error	108.18	22	8.19			
	Total	735.07	25				

## Discussion and Conclusion

The present study supports the effectiveness of cognitive rehabilitation program on prospective and retrospective memory in participants. This result was similar to study result of Castiglione, et al. (2016) and Ferguson et al. (2015). For explain of these finding, it can be stated that presence of the children with hearing impairment, coped their families with many problems (Ashori, et al., 2018)., while, cognitive rehabilitation program can directly or indirectly affect memory performance through executive functions or other cognitive process (Leding,

2019). Then, it is expected that this program improves of prospective and retrospective memory in students with hearing impairment. The present study was conducted on students with hearing impairment from 13 to 16 years old. The parents' socioeconomic status was not investigated, and opportunity for follow up was not provided. It is suggested that future research focus on the socioeconomic status of subjects and provided opportunity for follow up.

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