

Effectiveness of Training Neuropsychological Skills on Executive Function in Deaf Students with Cochlear Implants: A Single-Subject Research

Salar Faramarzi¹, Farzaneh Kazemini², Alireza Mohseni-Ezhiyeh³

Review Article

Abstract

Introduction: Children with cochlear implants, due to previous hearing deprivation, have damages in the areas of neuropsychological skills, including their executive functions. Since the executive functions are linked with a range of skills such as speech, language, communication, and education, this research aimed to investigate the effectiveness of training neuropsychological skills on executive function problems in deaf students with cochlear implants.

Materials and Methods: This study was a single-subject research with A-B design. The study population consisted of all deaf children with cochlear implants at the age of 6 to 12 years in Isfahan City, Iran. Among them, 5 were selected using purposive sampling method. The research instrument was the Connors Neuropsychological Questioner. To analyze the obtained data, after drawing the diagrams, we used visual analyses, trending, and stability, as well as percentages of non-overlapping and overlapping data.

Results: The mean scores of 5 subjects decreased from 62.47, 58.12, 61.19, 61.46, and 59.61 at the baseline to 48.22, 51.21, 49.30, 49.74, and 50.94 at the end of intervention, respectively. According to the visual analyses of the data diagrams, the intervention was effective on the studied subjects. The percentage of non-overlapping data in the two baseline and intervention situations for the subjects was 90%, 70%, 90%, 100%, and 80%. This effectiveness was observable in the follow-up stage.

Conclusion: According to the results of this study, we can judge that training neuropsychological skills reduce executive function problems in deaf students with cochlear implants, and this approach can be used in the training and rehabilitation centers of children with cochlear implants.

Keywords: Neuropsychological skills training; Executive function; Cochlear implant

Citation: Faramarzi S, Kazemini F, Mohseni-Ezhiyeh A. **Effectiveness of Training Neuropsychological Skills on Executive Function in Deaf Students with Cochlear Implants: A Single-Subject Research.** *J Res Rehabil Sci* 2019; 15(6): 311-8.

Received: 31.12.2019

Accepted: 30.01.2020

Published: 04.02.2020

Introduction

Deafness is one of the most common sensory-neurological defects in humans. In this disorder, hearing loss is such that the child, with or without a hearing aid, cannot process linguistic information through hearing (1). Studies show that for every 1,000 live births, 7 suffer from severe and profound deafness (2) and for every 750 live births, 1 suffers from predominant bilateral hearing loss (greater than 40 dB) (3). In the etiology of this disorder, various hypotheses have been proposed, which in general, a complex combination of environmental and genetic

impacts can be noted (4). Deafness affects various aspects of individual, social, educational, and professional life and has multifaceted effects and consequences on family and society (5-6).

One of the newest treatments raised for deaf children in recent years is cochlear implant. The cochlear implant is an electronic device that is surgically placed in the ear and provides the sense of hearing in individuals with deafness and has many speech and language advantages for them (7). On the other hand, cochlear implantation does not provide favorable outcomes for all children, rather it depends

1- Associate Professor, Department of Psychology and Education for Children with Special Needs, School of Education and Psychology, University of Isfahan, Isfahan, Iran

2- Department of Psychology, School of Educational Sciences and Psychology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

3- PhD Student, Department of Psychology and Education for Children with Special Needs, School of Education and Psychology, University of Isfahan, Isfahan, Iran

Corresponding Author: Salar Faramarzi, Email: s.faramarzi@edu.ui.ac.ir

on various factors such as early implantation, timely intervention, and family involvement in the education and rehabilitation of children (8). A wide range of research backgrounds indicate the fact that deafness and consequent deprivation of auditory experiences affect not only speech and language but also neurocognitive functions (9).

One of these excellent neuropsychological functions is the executive functions. Executive functions have traditionally been defined as an umbrella-like term for functions such as planning, working memory (WM), impulse control, inhibition, change of mood, as well as initiating and monitoring action (10). Some researchers believe that deaf children with cochlear implantation and hearing-impaired children with hearing aids suffer from a greater impairment in executive function compared to their normal-growing peers (11).

On the other hand, many studies have suggested that the components of executive functions are significantly correlated with speech and language development, reading skills, speech comprehension, and mutual communication (12-14). Given this, it is very important to pay attention to the executive functions, especially in the group of children with a cochlear implant.

One of the approaches that has been applied in this field in recent years is the use of neuropsychological interventions. Strengthening these skills seems to pave the way for improving their executive functions. To date, the effectiveness of strengthening neuropsychological skills on different groups of children with special needs has been investigated. For example, in a study, Baezat (15) evaluated the effect of neuropsychological interventions, with the findings suggesting that this intervention was effective on the reading and writing efficiency of students with developmental linguistic dyslexia. Jadidi Feighan et al. (16) reported that neuropsychological interventions improve the reading speed, accuracy, and comprehension in students with dyslexia. The effectiveness of neuropsychological interventions on improving the academic performance of children with learning disabilities has also been confirmed (17). The effectiveness of neuropsychological interventions on the language function of preschool children with specific language impairment (SLI) has also been proven (18,19).

On the other hand, so far, researchers have paid less attention to the role of neuropsychological interventions in children with cochlear implants. However, children with cochlear implants suffer from numerous impairments in neuropsychological

skills, including executive functions, due to previous hearing impairment. Since executive functions are associated with a wide range of speech, language, communication, and academic skills, and according to the study basics and background, the present study seems necessary to be conducted in order to examine the executive functions of children with cochlear implants along with other interventions. Therefore, the present study aims to investigate the effect of neuropsychological interventions on the executive functions of deaf students with a cochlear implant.

Materials and Methods

This study was approved with the code of ethics at the Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran. Given the objective and nature of the study, the single-subject method was employed, which is sometimes called single-subject experiment or time series experiment.

This study included intensive investigations on a limited number of individuals who were considered individually or as a single group (20). In this study, the A-B plan with follow-up was used to evaluate the function. Plan A-B consists of two test phases; Phase A (baseline) and Phase B (intervention) (21). The statistical population of the study included all deaf children with cochlear implants aged 6-12 years in Isfahan in 2017. In this study, purposive sampling method was used. The aim was to select individuals who would provide the researcher with a deep understanding of the study subject. The sample size is affected by the research method used in each study. In single-subject designs, more than one subject is used. This number can be increased up to 30 subjects (21). In this study, 5 children who met the inclusion criteria were selected.

The study inclusion criteria included children aged 6-12 years, severe to profound deafness, and having a cochlear implant. On the other hand, the exclusion criteria were parental dissatisfaction, absence of more than two training sessions, and having any kind of psychiatric disorders that was examined by a master of psychology with reference to the children's records. The characteristics of the subjects are summarized as follows:

Subject 1: A 7-year-old female student named (S. Z.) who was the only child of the family and used cochlear implants for about four years. The cochlear implant was performed unilaterally. She had received training in speech therapy, hearing training, occupational therapy, and play therapy. She also had a low speech clarity.

Subject 2: An 8-year-old female student named (H.P.), who was the only child of the family and it had been about four years who had undergone cochlear implantation. This child benefited from hearing training, speech therapy, and occupational therapy training in the past years. It was difficult to understand her words. Additionally, due to vision problems and lazy right eye (amblyopia), she was wearing glasses and she had a unilateral cochlear implantation.

Subject 3: An 8-year-old boy named (Sh. Sh.) with an older sister who had been using cochlear implants for about five years. This operation was performed unilaterally. In recent years, he had used speech therapy training, hearing training, occupational therapy, and play therapy. He had good speech clarity, but little accuracy and concentration.

Subject 4: A 9-year-old male student named (M Y. P.) with a younger brother who had the unilateral cochlear implant about four years ago. In previous years, he had used speech therapy training and hearing training. He had a hoarse voice and his speech was difficult to understand.

Subject 5: A 12-year-old girl student named (Z. M.), an only child who had a cochlear implant unilaterally nine years ago. Due to her parents' divorce, she is currently living with her mother and her new husband and two children. The two uncles of the subject are deaf. In recent years, she has used speech therapy, hearing training, and occupational therapy training sporadically. She has limited speech and very little vocabulary.

The study instrument was the Connors Neuropsychological Questionnaire. This questionnaire was developed by Connors in 2004 to assess neuropsychological problems in children aged 5-12 years. This scale examines attention function, sensory-motor function, executive functions, memory and learning, and cognition in four ranges (unobserved, mild, moderate, severe) (22). In 2011, Jadidi Feighan et al. translated and standardized this questionnaire. They reported an appropriate construct validity for this tool using factor analysis, and an internal consistency of 0.79 for this tool by Cronbach's alpha method (16).

To conduct the study, the researchers referred to the school for the deaf and selected the samples, who were 5 people in total, based on the inclusion criteria. The study period was 18 weeks, including the initial 4 weeks (observation stages), 10 middle weeks (training stages), and 4 final weeks (follow-up stages). After the end of the observation sessions, the training sessions, which were held individually,

began. Each session of neuropsychological skills training lasted 50 minutes, which was performed on children 3 days a week, and the Connors questionnaire was completed in each session as usual.

Intervention program: A combination of training programs was used to teach neuropsychological skills based on the studies by Semrud-Clikeman and Ellison (22). These sessions were held for 10 weeks as two 45-minute sessions per week. The goals and content of each week's sessions are summarized in table 1.

In order to analyze the collected data, the raw scores were first converted to standard T scores, and the baseline (initial information stage situation or situation A), intervention (or situation B), and follow-up situations of each subject were plotted on a graph. Then, in order to interpret and conclude these graphs, visual analysis, trend index, stability index, percentage of non-overlapping data (PND), and percentage of overlapping data (POD) were used. For visual analysis of the data diagram, after drawing the diagram for each subject, in the first step, using the median of data of the baseline and intervention situations, the midline of the data was drawn parallel to the x-axis and a stability envelope was placed on the midline. The stability envelope means two parallel lines, drawn one below and the other above the midline. The distance and range between the two lines indicate the degree of protrusion or variability of the data series. Using the 20-80% criterion, if 80% of the data points are below or within 20% of the median value (stability envelope), the data is said to be stable.

Then, to study the data trend, the split-half method was used and the trend line stability envelope was drawn based on the 20-80% criterion. After drawing the midline and trend line and their stability envelope, descriptive statistics indices such as median and mean and inter-situation and intra-situation visual analysis indices such as level and trend change as well as PND were calculated. PND indicates the percentage of non-overlap of points in the two experimental situations (baseline and intervention).

The level of experimental control in a single-subject study depends on the level change from one situation to another and PND. Moreover, the higher the PND between two adjacent situations, the more confident the intervention can be. It should be noted that all stages of the visual analysis in this study were adopted from the book *Single Subject Research Methodology in Behavioral Sciences* by Ledford and Gast (21).

Table 1. Summary of neuropsychological skills training sessions

Week	Goal	Content
First	Reducing anxiety and worry, strengthening short-term memory	Introducing and getting to know the subject, getting acquainted with treatment sessions, relaxation training, rest and entertainment, practicing with memory cards
Second	strengthening auditory and visual attention, strengthening and maintaining attention and focus	Reviewing the contents and tasks of the previous session, practicing with attention cards, teaching colors and directions with pictures, moving objects, resting and entertaining, staring at objects, introducing toys to strengthen attention to parents (like bowling)
Third	strengthening the executive functions at the level of planning and organization	Review of the contents and tasks of the previous session, using simple mazes for training and then practicing with complex mazes, telling stories and asking questions and concluding, resting and entertaining, classifying similar geometric cardboard shapes (from Size, shape, color), crossing classroom floor obstacles, problem solving and asking the child for a solution
Fourth	Strengthening working memory, auditory and visual memory, recognizing memory	Reviewing the contents and assignments of the previous session, practicing with memory cards and teaching classification, resting and entertaining, putting things on the table and then, asking their names without looking, repeating the said words
Fifth	Strengthening language skills such as auditory sensitivity, strengthening spatial skills, strengthening attention and auditory distinguishing	Reviewing the contents and tasks of the previous session, making a short sentence at first and converting it into a meaningful story or text, resting and entertaining, recognizing shapes similar to the given shape, telling a story about the related images
Sixth	Strengthening visual-spatial processing, strengthening eye-hand coordination	Reviewing the contents and tasks of the previous session, practicing categorization of similar shapes, regardless of their shape, size, and color, resting and entertaining, practicing routing in different mazes, learning to fill in the blank shapes with the given sample
Seventh	Strengthening working memory and auditory and visual memory, strengthening sustained attention	Reviewing the contents and tasks of the previous session, observing and touching the doll and then, taking it and asking for the doll's specifications and asking the child to draw the doll, resting and entertaining, practicing holding hands in front of the face slowly, paying attention to each finger and bending them one by one and straightening them again in the same way, drawing different shapes with the eyes closed
Eighth	Strengthening attention, strengthening planning for the short-term purpose	Reviewing the contents and tasks of the previous session, presenting the differences between the two images by the child, resting and entertaining, showing a shape and then covering it and asking for details, choosing the best path in the mazes
Ninth	Strengthening working memory, recognizing memory, strengthening eye-hand coordination	Reviewing the contents and tasks of the previous session, preparing pairs of cards from a picture and picking them upside down and finding similar cards by the child, showing a word to the child and asking the child to look at and say the word aloud and also write the word with the index finger in the air, resting and entertaining, showing the card in which the letters of a word are written and only one of the letters was deleted, which the child had to point to, showing the film and asking some questions about it
Tenth	Strengthening attention, sustained attention, strengthening auditory memory	Reviewing the contents and tasks of the previous session, practicing with memory cards, staring at objects, breathing in ten numbers and just thinking about its sound and exhaling again with the same ten numbers, resting and entertaining, playing ambient sounds with the recorded tape and reading a story at the same time and then, asking questions about the content of the story

Results

In order to summarize the results obtained, each of the baseline, treatment, and follow-up sessions for participants in the tables and graphs is as follows.

Table 2 presents the scores of executive function problems in the baseline situation for all three subjects. Then, the scores of executive function problems in each of the treatment sessions and the follow-up situation were specified in table 3.

According to table 3, it was found that the executive function problems in all 5 subjects decreased

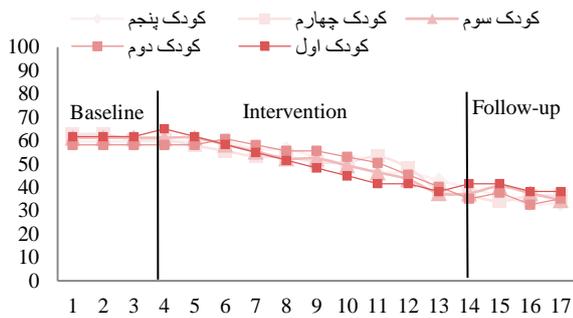
with sessions. The findings of tables 2 and 3 are shown in the form of data graphs as follows (Figure 1).

Table 2. Scores of executive function problems in the baseline situation for all 5 subjects

Subject	Baseline situation (A)			
	1	2	3	4
1	61.64	61.64	61.64	64.99
2	58.13	58.13	58.13	58.13
3	61.19	61.19	61.19	61.19
4	62.67	62.67	62.27	62.27
5	59.62	59.62	59.62	59.62

Table 3. Scores of executive function problems in the intervention and follow-up situations for all 5 subjects

Subject	Intervention situation (B)										Follow-up		
	1	2	3	4	5	6	7	8	9	10	1	2	3
1	61.64	58.29	54.93	51.58	48.22	44.87	41.52	41.52	38.16	41.52	41.52	38.16	38.16
2	58.13	60.68	58.13	55.57	55.57	53.01	50.45	45.33	40.22	35.10	37.66	32.54	35.10
3	61.19	58.22	55.25	52.27	52.27	49.30	46.33	43.36	37.41	37.41	40.38	37.41	34.44
4	57.88	55.49	53.10	53.10	50.70	50.70	53.10	48.31	48.74	36.35	33.96	32.93	32.93
5	59.62	59.62	56.28	56.28	52.94	49.61	46.27	46.27	42.94	39.60	36.26	32.93	32.93

**Figure 1.** Changes in executive function problems for all 5 subjects

The mean baseline and intervention situations as well as data overlap in 5 subjects are shown in table 4.

Table 4. Mean baseline and intervention situations and data overlap

Subject	Baseline situation	Intervention situation	PND (%)	POD (%)
1	62.47	48.22	90	10
2	58.12	51.21	70	30
3	61.19	49.30	90	10
4	61.46	49.74	100	0
5	59.61	50.94	80	20

POD: Percentage of overlapping data; PND: Percentage of non-overlapping data

Figure 2 shows the midline, trend line, and stability envelope of subject 1. Accordingly, and given the PND index, the degree of overlap between the baseline points and intervention has been effective with 90% confidence.

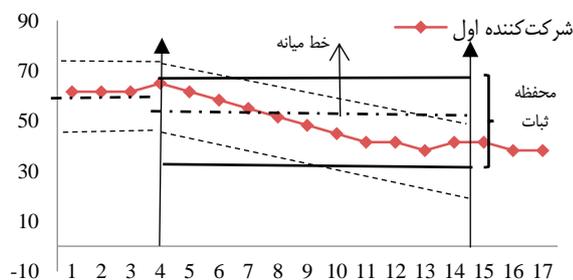
**Figure 2.** Changes in executive function problems for subject 1

Figure 3 shows the midline, trend line, and stability envelope of subject 2. Accordingly, and given the PND index, the degree of overlap between the baseline points and intervention has been effective with 70% confidence.

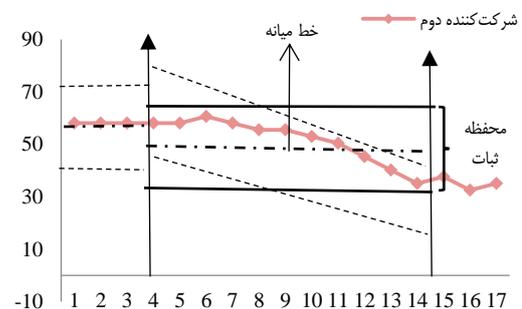
**Figure 3.** Changes in executive function problems for subject number 2

Figure 4 shows the midline, trend line, and stability envelope for subject 3. Accordingly, and given the PND index, the degree of overlap between the baseline points and intervention has been effective with 90% confidence.

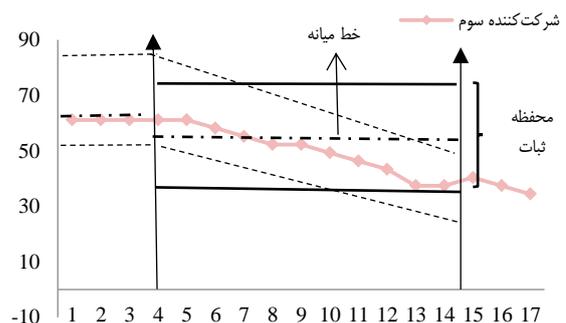
**Figure 4.** Changes in executive function problems for subject 3

Figure 5 shows the midline, trend line, and stability envelope for subject 4. Accordingly, and given the PND index, the degree of overlap between the baseline and intervention points has been effective with 100% confidence.

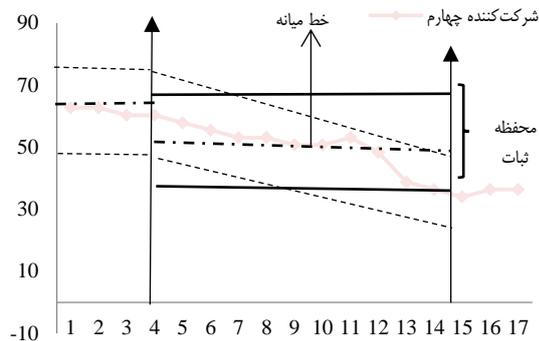


Figure 5. Changes in executive function problems for subject 4

Figure 6 shows the midline, trend line, and stability envelope for subject 5. Accordingly, and given the PND index, the degree of overlap between the baseline and intervention points has been effective with 80% confidence.

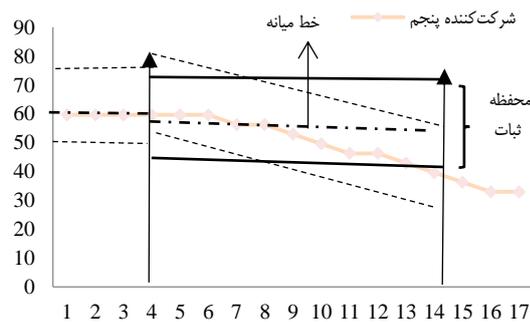


Figure 6. Changes in executive function problems for subject 5

Discussion

The current study was accomplished with the aim to investigate the effectiveness of neuropsychological skills training on executive function problems in deaf students with cochlear implants. Given figures 1-4, after receiving the intervention, the executive function problems in all 5 subjects showed a downward trend in the direction of the goal (reduction of executive function problems). Moreover, analysis of data in the follow-up phase suggested that the effectiveness was still sustainable. The findings of this study are indirectly consistent with other studies (15-19).

In explaining these findings, it can be claimed that neuropsychological skills are obtained from experience, education, and learning. Most children and students perform these skills automatically, but children with cochlear implants are unable to learn these skills spontaneously due to the initial deafness

experience, and therefore need to be supported with rich experiences. Because neuropsychological skills are important mediating functions, they create complex and purposeful systems that become the basis for cognition, and the development of cognitive skills is effective in the overall development of the child and it is likely that the development and strengthening of neuropsychological systems in children in the early years of life is the basis for the development of perceptual skills, especially cognitive systems. (22). Explaining the finding that training neuropsychological skills reduces executive function problems (attention, memory, sensory-motor function, problem solving-planning, and behavioral-emotional organization), it can be said that executive functions with abilities in the process of learning are of a special importance. These abilities help the child evaluate his or her performance, remove potential barriers, and assess his or her progress.

Therefore, by enriching the environment and laying the groundwork for appropriate games, growth and improvement of executive functions will be achieved; as these skills are acquired through experience, training, and learning (16,17).

In another explanation of this issue, it can be pointed out that the improvement of cognitive skills is to a large extent related to the student's experiences. The student gains his/her experiences in various ways, especially games during development. Therefore, if it is possible to enrich the environment and pave the way for appropriate games, it is likely that it will help to develop and improve children's cognitive skills (16). In other words, it can be said that neuropsychological skills are considered in psychological texts as a prerequisite for learning in children in primary school; Therefore, teaching neuropsychological skills through games and activities due to its appropriate cognitive and developmental activities that are performed with happiness in an attractive manner, with its effects on physical health and happiness of children, leads to the development of neuropsychological skills (such as executive functions) (17,18).

In addition, researchers believe that when it comes to educating children (such as children with cochlear implants), it is best to perform it with objects and equipment that are attractive to the child (such as using his or her favorite toys), in addition to doing the things that the child prefers. Giving the child the right to choose causes the achievement of the goal to be accelerated and the child to spontaneously engage in interaction with the adults during education (19). Teaching neuropsychological skills in this study, using

these principles and based on the studies of Semrud-Clikeman and Ellison (22), caused the child to be more involved in activities and games and was able to significantly improve children's cognitive skills.

Limitations

The age range of the study population was limited to the students with dyslexia. Therefore, caution should be exercised in extending the results to other groups. The statistical population in this study was students with cochlear implantation in Isfahan. Therefore, in generalizing the findings of the study, this point should be taken into account. Furthermore, because only students with cochlear implants were the statistical sample of this study, generalization of the results to other groups should be performed with caution. Limited sample size was one of the limitations that affected some of the findings of this study.

Recommendations

It is suggested that further investigations be conducted with a larger sample size and greater age range. It is also suggested that, along with other educational methods and rehabilitation of children with cochlear implants, training of neuropsychological skills be used. Additionally, according to the results of this study, it is suggested that the educational package and rehabilitation training of neuropsychological skills be provided to mothers, caregivers, and educators of children with cochlear implants.

Conclusion

The results of the present study revealed that the training of neuropsychological skills is likely to reduce the problems of executive functions in deaf children with cochlear implants.

Acknowledgments

The authors would like to appreciate the authorities and the families who helped us in all stages of this study.

Authors' Contribution

Salar Faramarzi: Study design and ideation, attracting financial resources for the study, performing support, executive, and scientific services of the study, providing study equipment and samples, specialized evaluation of the manuscript in terms of scientific concepts, approval of the final manuscript to be submitted to the journal office, responsibility for maintaining the integrity of the study process from the beginning to publication, and responding to the referees' comments; Farzaneh Kazemini: providing study equipment and samples, data collection, analysis and interpretation of results, specialized statistical services, manuscript preparation, specialized evaluation of the manuscript in terms of scientific concepts, approval of the final manuscript to be submitted to the journal office, responsibility for maintaining the integrity of the study process from the beginning to publication, and responding to the referees' comments; Alireza Mohseni-Ezhiyeh: analysis and interpretation of results, specialized statistical services, manuscript preparation, specialized evaluation of the manuscript in terms of scientific concepts, approval of the final manuscript to be submitted to the journal office, responsibility for maintaining the integrity of the study process from the beginning to publication, and responding to the referees' comments.

Funding

This study was based on the secondary analysis of part of the information obtained from a MSc thesis in psychology conducted by Farzaneh Kazemini with the financial support of Isfahan (Khorasgan) Branch, Islamic Azad University. This university did not comment on data collection, analysis, and reporting, manuscript preparation, and final approval of the article for publication.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Adelabu B, Ojogbane V. Coping with Handicapped and Exceptional Learners by Student Teachers of Tertiary Institutions. *International Journal of Innovative Research and Development* 2012; 1(11): 69-80.
2. Bubbico L, Rosano A, Spagnolo A. Prevalence of prelingual deafness in Italy. *Acta Otorhinolaryngol Ital* 2007; 27(1): 17-21.
3. Thompson DC, McPhillips H, Davis RL, Lieu TL, Homer CJ, Helfand M. Universal newborn hearing screening: Summary of evidence. *JAMA* 2001; 286(16): 2000-10.
4. Faramarzi S, Mohseni Ezhiyeh A, Abtahi SH, Sepehrnejad M. Research paper: Relationship of parent-child stress with cochlear implanted children's developmental skills. *J Rehab* 2016; 17(2): 118-27. [In Persian].
5. Hintermair M, Sarimski K. Fathers of deaf and hard-of-hearing infants and toddlers-experiences, needs, and challenges. *J Deaf Stud Deaf Educ* 2018; 24(2): 84-94.
6. Whicker JJ, Munoz K, Nelson LH. Parent challenges, perspectives and experiences caring for children who are deaf or hard-of-hearing with other disabilities: A comprehensive review. *Int J Audiol* 2019; 58(1): 5-11.

7. Geers A, Tobey E, Moog J, Brenner C. Long-term outcomes of cochlear implantation in the preschool years: from elementary grades to high school. *Int J Audiol* 2008; 47(Suppl) 2: S21-S30.
8. Beer J, Kronenberger WG, Pisoni DB. Executive function in everyday life: implications for young cochlear implant users. *Cochlear Implants Int* 2011; 12(Suppl 1): S89-S91.
9. Marc M, Patricia ES, David BP, Christopher MC, William GK, Shirley H, et al. Executive function, cognitive control, and sequence learning in deaf children with cochlear implants. In: Marschark M, Spencer PE, editors. *The Oxford handbook of deaf studies, language, and education*. Oxford, UK: Oxford University Press; 2010.
10. Gioia GA, Isquith PK, Guy SC. Assessment of executive functions in children with neurological impairment. In: Simeonsson R, Rosenthal S, editors. *Psychological and developmental assessment: children with disabilities and chronic conditions*. New York, NY: The Guilford Press; 2001. p. 317-56.
11. Kronenberger WG, Pisoni DB, Henning SC, Colson BG. Executive functioning skills in long-term users of cochlear implants: a case control study. *J Pediatr Psychol* 2013; 38(8): 902-14.
12. Spencer M, Richmond MC, Cutting LE. Considering the role of executive function in reading comprehension: a structural equation modeling approach. *Scientific Studies of Reading* 2020; 24(3): 179-99.
13. Henry LA, Messer DJ, Nash G. Executive functioning in children with specific language impairment. *J Child Psychol Psychiatry* 2012; 53(1): 37-45.
14. Barkley RA. *Executive functions: What They are, how they work, and why they evolved*. New York, NY: The Guilford Press; 2012.
15. Baezat F. The effects of neuropsychological intervention (HAS) on reading and writing efficiency of linguistically dyslexic students: Single case study. *Journal of Applied Psychology*, 2009; 3(11): 7-19. [In Persian].
16. Jadidi Feighan M, Abedi A, Jamali Paghale S, Jadidi Feighan M. Effectiveness of neuropsychological interventions on the reading components (Speed, accuracy and understanding) of students with dyslexic. *Research in Clinical Psychology and Counseling* 2015; 4(1): 115-34. [In Persian].
17. Abedi A. Investigation of effectiveness of neuropsychological interventions for improving academic performance of children with mathematics learning disabilities. *Advances in Cognitive Science*, 2010; 12(1): 1-16. [In Persian].
18. Faramarzi S, Yarmohamadian A, Malekpour M, Shirzadi P, Qasemi M. The effect of neuropsychological interventions on language performance in preschool children with specific language impairment (SLI): A case study. *Middle Eastern Journal of Disability Studies* 2016; 6: 304-16. [In Persian].
19. Faramarzi S, Shirzadi P, Qasemi M, Yarmohamadian A. The effect of neuropsychological interventions on language performance of children with specific language impairment (SLI): A single subject study 2016; 4(4): 51-61.
20. Ghasemi F, Karimi M, Dabaghi P. The effectiveness of Mindfulness-Based Cognitive Therapy on the quality of life in women with breast cancer. *Nurse and Physician within War* 2018; 6(20): 51-9. [In Persian].
21. Ledford JR, Gast DL. *Single subject research methodology in behavioral sciences*. New York, NY: Routledge; 2014.
22. Semrud-Clikeman M, Ellison PAT. *Child neuropsychology: assessment and interventions for neurodevelopmental disorders*. 2nd ed. New York, NY: Springer; 2009.
23. Dawson P, Guare R. *Executive skills in children and adolescents: A practical guide to assessment and intervention*. New York, NY: The Guildford Press; 2010.