Research Article

Effect of Online Unified Protocol for Transdiagnostic Treatment of Emotional Disorders on Emotion Perception of School-Aged Children with Cochlear Implant

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Citation: Mehrdadfar M, Ghasemzadeh S, Ghobari Bonab B, Hasanzadeh S, Vakili S. Effect of Online Unified Protocol for Transdiagnostic Treatment of Emotional Disorders on Emotion Perception of School-Aged Children with Cochlear Implant. Aud Vestib Res. 2023;32(2):128-36.

https://doi.org/10.18502/avr.v32i2.12183

Highlights

- This study evaluated emotional perception in children with cochlear implants (CIs)
- The UP for transdiagnostric treatment of emotional disorders is performed in CIs

Article info:
Received: 05 Oct 2022
Revised: 28 Nov 2022
Accepted: 30 Nov 2022

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ABSTRACT

Background and Aim: Emotion perception means the ability to identify, predict and explain one's own emotions and those of others. Less attention has been paid to the psychosocial effects of hearing loss such as emotion perception. The current study aimed to investigate the effect of the unified protocol for transdiagnostic treatment of emotional disorders on emotion perception of children with Cochlear Implant (CI).

Methods: This is a quasi-experimental study with a pretest/post-test/follow-up design. Participants were 18 children with CI aged 8–11 years and their mothers were randomly divided into experimental and control groups. All mothers and their children in the experimental group received the Unified Protocol (UP) program online at 20 sessions twice a week. For the evaluation of emotion perception, we used the Test of Emotion Comprehension (TEC) which had high internal consistency. For statistical analyses, descriptive statistics and repeated measures ANOVA were used.

Results: Mean score of emotion comprehension test at the mental and reflective levels and its overall score were significantly different between pretest and post-test and between pretest and follow-up phases in both group. The difference in the external level of emotion perception was not significant among three phases in any groups.

Conclusion: The UP program can positively affect the emotion perception in children with CI, especially in more difficult levels (mental and reflective), and its effects remain stable three months after the intervention.

Keywords: Emotion; children; cochlear implants; perception; transdiagnostic treatment.

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Introduction

Sensorineural Hearing Loss (SNHL) results in difficulties perceiving speech and auditory nonverbal cues, cognition, and self-regulation of their emotions. Emotion perception refers to the ability to identify, predict and explain one's own emotions and those of others [1]. Difficulties in perception of the emotional state of the speaker may lead to the lack of awareness of his/her impact on others, lack of empathy, and social skills that are not adapted to the condition [2-4]. Cochlear Implants (CIs) transform acoustic signals into electrical codes and directly stimulate VIII fibers and compensate the hearing deprivation in SNHL [5]. It is considered as an effective device for having communication and auditory skills in people with SNHL [6]. The early diagnosis and rehabilitation can result in higher developmental abilities in these people. Main factors for typically-developing maturation in children with CIs include the age of implantation [7, 8], the duration of CI use [9], and the onset of hearing loss [10]. In many current CIs, the place and the temporal pitch-encoding mechanisms are inadequate, resulting in difficulties when transferring information salient for the perception of suprasegmental and emotional features of speech [3, 11, 12]. Outcomes of cochlear implantation such as speech production skills, auditory skills, perception of speech in noise have been reported in many studies [3, 13]. However, less attention has been paid to their psychosocial outcomes such as emotional perception and social skills. Emotion plays a key role in understanding and enjoying the music [14] and language [15]. Semantic-lexical capabilities and syntactic abilities are strongly related to the ability to perceive emotions [15]. Moreover, the ability to understand emotion is an important prerequisite for social, psychological, and cognitive developments [16, 17].

A large number of studies have assessed the emotional perception in people with hearing loss and CI. For example, Michael, et al., using the strengths and difficulties questionnaire, assessed socio-emotional states in 32 children with CI. They suggested the effect of early implantation on the improvement of socio-emotional functioning in children with CIs [6]. In the other study, Most and Aviner investigated the perception of emotion (sadness, anger, happiness, surprise, disgust, and fear) using visual, auditory, and visual-auditory modes in children with hearing loss and CI. Although visual-auditory mode was the best method for emotion perception in normal-hearing children, there was not any significant difference among three modes in children with CI [3]. Wiefferink, et al. indicated two aspects of emotion perception including emotion recognition in facial expressions and emotion attribution in situational contexts and assessed their associations with communication skills in 57 children with CI and 52 normal-hearing children. They concluded that hearing loss affects all aspects of emotional perception in children with CIs [18]. In the study by Wang et al., children with CI had higher problems in perceiving emotion and the tone expression matching task [19]. Despite attention to the assessment of emotion perception in children with CI in literature, there is little evidence about the effectiveness of an early emotion perception intervention in these children. Nathan et al. indicated that family-oriented interventional program is useful for the development of emotions in children with hearing loss [20]. The Unified Protocol (UP) for transdiagnostic treatment of emotional disorders is a method for applying transdiagnostic treatment principles to reduce emotional disorders using a single protocol [21, 22]. Some previous studies have used this protocol to improve emotional regulation in anxious pupils and the parenting methods of their mothers [23], in children with diabetes type 1 [22], and for reducing anxiety and depression levels in school-aged children [22], but not in children with CI.

Children with hearing loss are less exposed to emotional language in school, because they cannot completely perceive the auditory cues important for the perception of emotions. They often use visual information more than normal-hearing children [18]. Unfortunately, parents and others do not teach them how to perceive complex emotions [4]. The negative effects of inaccurate perception of emotions include low self-esteem, loneliness, and peer rejection [24]. These outcomes are important because they are effective in social and emotional problems in adolescence and adulthood. Therefore, it is required to assess the emotion perception ability of children with CIs to minimize the negative effect of lack of early education in these children. As the goal of education is to achieve knowledge and develop attitudes and practical skills in adulthood, children are required that their emotion, responsibility, and self-regulation skills be monitored [25]. The treatment of emotional perception impairment in children with CI by interventional programs can help them. In this regard, the recent study aims to examine the effect of an UP program on the emotion perception of children with CI.

Methods

This is a quasi-experimental study with a pretest/posttest/follow-up design using a control group. Participants were 18 children with CI aged 8–11 years old from various available clinics and schools in Tehran, Iran. Moth-

ers of these children were also selected as participants using a non-random sampling method. Children with CI had severe to profound bilateral SNHL without any non-syndromic deafness and three years of cochlear implantation. None of children had received any other psychological interventions. They were matched for age, age of implantation, educational level, and gender. All children had normal-hearing parents. Children with cochlear implants were randomly divided into intervention and control groups.

For assessment of emotion perception in the study groups, we used the Test of Emotion Comprehension (TEC) [1, 26] which measures emotion perception at three levels (external, mental, and reflective) and has nine components, validated for children aged 3–11 years [1]. A professional expert asked the TEC questions from children verbally, and then completed and recorded their scores. The internal consistency of TEC is 0.76 and its Intraclass Correlation Coefficient (ICC) is 0.90 [1]. In our study, Cronbach alpha for examining the internal consistency of the Persian TEC was obtained 0.83. This indicates that the Persian TEC for children with CI had high internal consistency. The total score of TEC ranges from 0 and 9. This test was conducted before, immediately after, and three months after the intervention (follow-up).

Before the study, the researchers introduced themselves and communicated with children using a spoken language. The treatment program was presented to children and their mothers. The mothers were educated about all steps of the UP program. The program was presented at 20 sessions twice a week, 90 minutes for children with CI and 30 minutes for their mothers. The UP protocol includes five components designed to target the central aspects of emotion processing and regulation of emotional experiences. In this study, we used the five components proposed by Ghasemzadeh et al., including: a) psychoeducation about emotions and increasing awareness about them, b) cognitive flexibility training, c) identifying and preventing emotion avoidance and controlling emotion-driven behaviors, d) tolerance of bodily sensations related to emotions, and e) interoceptive and situation-based emotion exposure [22]. Table 1 summarizes the UP protocol for children with CI. We tried to use items suitable for children with CI in school and their relationships with peers. Due to the need for repetition, the number of sessions in this protocol was increased for children with CI.

The data were analyzed in SPSS v.17 software. Kolmogorov-Smirnov test was used to examine the normality of data distribution whose results showed that the distribution was normal (p= 0.200). Descriptive statistics (mean, and standard deviation) were used to describe the data. For within- and between-group comparisons, repeated measures analysis of variance (ANOVA) was conducted followed by Greenhouse-Geisser correction, if needed. The significance level was set at 0.05.

Results

Table 2 presents the mean and standard deviation of TEC scores in two groups at pretest, post-test, and follow-up phases. As can be seen, emotion perception at three levels at the post-test and follow-up phases was increased in the CI group. Their score in the post-test phase was increased by about 3.89, while this increase was 4.22 in the follow-up phase. The mean scores remained almost stable after three months of follow-up. In Table 3, the results of univariate ANOVA showed no significant interaction effect of group and time at the external level of emotion perception in the CI group compared to the control group, indicating no statistically significant difference at the external level among the pretest, post-test, and follow-up phases ($F(1,17)=1.73$; $p=0.210$). At the mental level ($F(1,30)=4.89$; $p=0.030$), reflective level ($F(2,32)=16.77$; $p<0.001$), and in overall ($F(1,22)=20.77$; $p<0.001$) there were statistically significant differences. In the other words, the pattern of changes in two groups was not parallel or random. Therefore, the UP program could affect the CI group in the post-test and follow-up phases. The results in Table 4 showed that the group-time interaction effect on emotion perception was significantly different between the pretest and post-test phases ($F(1,16)=15$; $p=0.001$) and between the pretest and follow-up phases ($F(1,16)=4.66$; $p=0.047$). Hence, it can be said that the changes caused by the UP program were persistent for at least three months. Figure 1 illustrates the comparison of mean scores at three different levels of emotion perception (external, mental, and reflective) and total score at three phases in the two-study group. The total score of TEC in children with CIs changed in the post-test and follow-up phases.

Discussion

Hearing loss is a disabling condition that affects the quality of life mostly in terms of auditory function, speech perception, and psychosocial function [27]. Cochlear implantation can compensate the hearing loss in people with hearing loss. Due to limitations of CI devices and other factors, children with CI often report psychological problems, especially in emotional skills.

Table 1. Content of the training s of unified Transdiagnostic treatment protocol for children with cochlear implants and their parents

Sessions	Content of children's training s	Content of mother's training
First	Identification of the structure of treatment of children, identifying problems, eliciting understanding and unity between group members and the therapist, increasing emotional awareness	Identifying the five structures and skills to mothers, introducing the three-part model of emotions to parents, discussing the avoidance cycle and other emotional behaviors
Second and third	The identification and scaling of different emotions, normalizing emotional experiences, helping children understand the avoidance cycle	Familiarizing with the four emotional parenting behaviors and their opposite parenting behaviors, discussing the provision of positive reinforcement as a parenting behavior with criticism
Fourth	Learning the concept of opposite action, using scientific experiments for emotional behaviors and opposite behavior, learning to track emotions and activities	Explaining of scientific experiments for the behavior opposite to emotional behaviors, discussing with mothers about how to support children in scientific education focused on grief and sadness, providing mothers with 10 ways to strengthen the child
Fifth	Previous s and practice	Previous s and practice
Sixth	Describing the concept of body clues and their relationship with intense emotions, learning how to identify body clues related to different emotions	Teaching the concept of somatization, training how to perform a body scan, familiarizing parents with sensory exposure and practicing sensory exposure in the , teaching how to empathize with children
Seventh and eighth	Teaching the concept of flexible thinking, teaching how to identify mental traps	Familiarizing the concept of cognitive flexibility and four common cognitive traps, discussing emotional parenting behavior with a focus on instability and its opposite parenting behavior, strengthening stable discipline
Ninth to eleventh	Introducing the concept of emotions detective in a none motional way using a coding game, using the detective thinking skill	Explaining the concept of cognitive detective, practicing detective thinking, familiarizing mothers with maximum emotional parenting behavior/maximum support and opposite parenting behavior, giving healthy independence
Twelfth and thirteenth	Teaching problem-solving using a non-emotional example or problem-solving game, practicing problem-solving using more personal and more specific scenarios	Explaining problem-solving steps, indicating the application of problem-solving for interpersonal conflicts, assessing mothers' efforts for giving healthy independence
Fourteenth	Learning the skill of "experiencing my emotions", teaching contact with the present moment to the children by playing the game of "using my five senses", introducing the idea of non-judgmental awareness	A discussion of the importance of learning to experience emotions, familiarizing the concept of contact with the present moment, and non-judgmental awareness
Fifteenth	Reviewing the emotion detective skill, reviewing the concepts of emotional behaviors and opposite action to prepare people for a new type of scientific experiment called exposure, doing exposure using a doll or other objects	Identifying the concept of situational emotion exposures as another type of scientific experiment, explaining the role of mothers in performing the exposure at home, familiarizing emotional parenting behavior and extreme modeling of intense emotions and avoiding its
Sixteenth	Revision of the concept of using scientific experiments to deal with intense emotions, introducing the idea of safety behaviors and subtle avoidance behaviors (such as distraction), practicing a scientific experiment to deal with intense emotions	Revision of the concept of exposure to emotion and discussing the application of exposure for different symptoms
Seventeenth to nineteenth	Programming and implementing situational exposure to emotion, planning and implementing exposure activities	Programming and implementing situational exposure to emotion, planning and implementing exposure activities
Twentieth	Reviewing the emotions detective skills, planning to deal with intense emotions in the future to prevent recurrence, appreciating the progress	Exercising the emotions detective skills and opposite parenting behaviors, discussing and appreciating each child's progress, planning to maintain and enhance post-treatment progress, distinguishing between regression and relapse, and helping parents identify the warning signs of relapse

Note: This program is deducted from Ghasemzadeh et al. (2020).

Table 2. Descriptive statistics for variable of emotional perception in cochlear implants group and control group

Variables		Group	Pretest	Post-test	Follow-up
			Mean(SD)	Mean(SD)	Mean(SD)
Emotional perception	External	Test	12.44(1.59)	13.78(0.44)	13.78(0.44)
		Control	13(1.58)	13.56(0.88)	13.56(0.73)
	Mental	Test	1.78(0.67)	2.67(0.50)	2.78(0.44)
		Control	2.00(0.87)	2.22(0.83)	2.00(1.00)
	Reflective	Test	1.56(0.88)	3.22(0.67)	3.44(0.73)
		Control	2.11(0.60)	2.11(0.78)	1.78(0.83)
	Total score	Test	15.78(1.92)	19.67(1.12)	20(1.32)
		Control	17.11(1.90)	17.89(1.17)	17.33(1.00)

The main objective of this study was to assess the effectiveness of the UP program on the emotion perception of children with CI. The findings indicated that, at the external level, two groups of CI children (experimental and control groups) showed no significant difference among pretest, post-test, and follow-up phases, while this difference was significant at the mental and reflective levels and in overall. Probably, the understanding of emotions at the external level was easier for children with CI, as it has been shown in children with typical development [1]. The results indicates that the UP program could directly affect the emotional perception in children with CI, whose effect was lasted for three months after the treatment.

Although previous studies have focused on the evaluation of emotions and delayed emotional response in different levels in children with CI or those with hearing loss [3, 6, 18, 19, 28], there is no evidence of developing interventions for emotion perception or psychological problems in people with CIs. Our findings were consistent with the results of Picou et al. who confirmed that training and counseling interventions could improve various kinds of emotion perception [27]. They suggested that in people with hearing loss, the interventions that focus on pitch perception and spectral resolution can often modify interindividual emotion perception, by correcting audibility without excessive loudness [27]. Our findings are also consistent with the results of Majorano et al. who emphasized that early implantation in the pre-school age could results in improvement of emotion understanding in adolescents with CI [29]. Mancini et al. explained that longer auditory experience by CI along with early intervention can cause improvement in communication which positively affects the acquisition of listening and language skills, and emotion development [30].

Table 3. The results of UANOVA for emotional perception in cochlear implants group and control group

Variables		Sum square	Mean of sum square	F(df)	p	Eta squared
Time	External	10.70	9.61	10.19(1,17)	0.004	0.39
	Mental	3.37	2.59	7.07(1,20)	0.100	0.31
	Reflective	7.82	3.91	10.89(2,32)	<0.001	0.41
	Total	62.37	44.41	32.62(1,22)	<0.001	0.67
Time and group interaction	External	1.82	1.63	1.73(1,17)	0.207	0.10
	Mental	2.33	1.79	4.89(1,20)	0.030	0.23
	Reflective	12.04	6.02	16.77(2,32)	<0.001	0.51
	Total	39.70	28.27	20.77(1,22)	<0.001	0.57

Table 4. A comparison of three levels of emotional perception in control group and cochlear implants group in three conditions (pre-test, post-test, and follow-up

Variables	Time and group interaction					
	Times	Sum square	Mean of sum square	F(df)	p	Eta squared
External	Pretest-Post-test	2.72	2.72	1.66(1,16)	0.216	0.09
	Pretest-Follow	2.72	2.72	1.96(1,16)	0.181	0.11
	Post-test-Follow	0.00	0.00	0.00(1,16)	<0.001	0.00
Mental	Pretest-Post-test	2.00	2.00	3.79(1,16)	0.069	0.19
	Pretest-Follow	4.50	4.50	6.00(1,16)	0.026	0.27
	Post-test-Follow	0.50	0.50	3.27(1,16)	0.089	0.17
Reflective	Pretest-Post-test	12.50	12.50	20.00(1,16)	<0.001	0.56
	Pretest-Follow	22.22	22.22	27.59(1,16)	<0.001	0.63
	Post-test-Follow	1.39	1.39	1.92(1,16)	0.185	0.11
Total	Pretest-Post-test	43.56	43.56	15.00(1,16)	0.001	0.48
	Pretest-Follow	72.00	72.00	34.79(1,16)	<0.001	0.69
	Post-test-Follow	3.56	3.56	4.66(1,16)	0.047	0.23

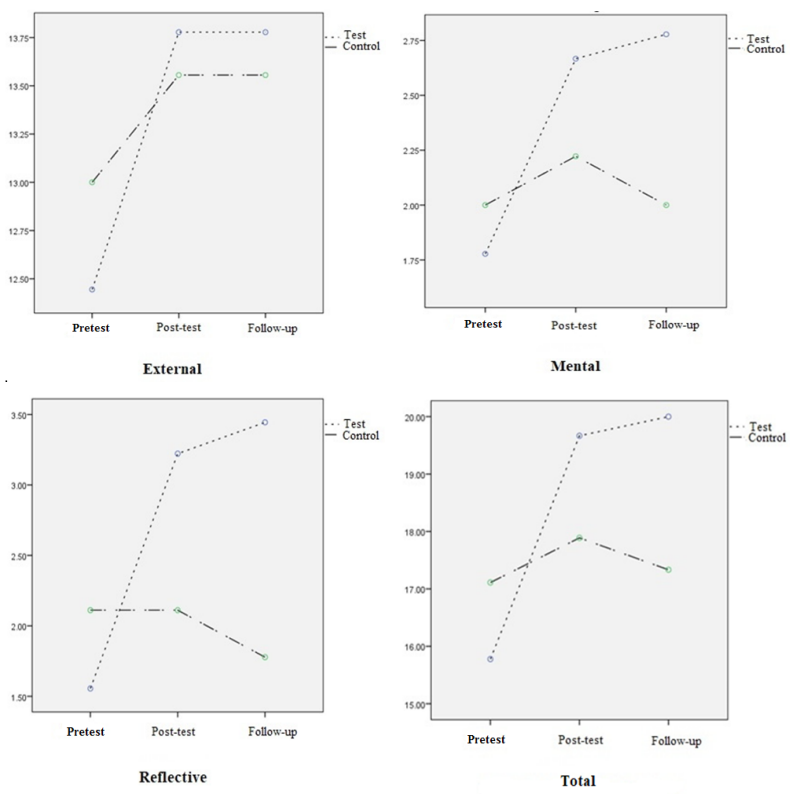

Figure 1. Emotional perception. A comparison of mean scores of the three various levels of emotional perception (external, mental, and reflective), and total scores in three conditions (pretest, post-test, and follow up) in cochlear implant children (test) and control group

Few studies have used the UP protocol in clinical populations but not in children with CI. Ghasemzadeh and Naghsh showed the effectiveness of this interventional program in improvement of emotions in children with diabetes Type I [22]. They found that the anxiety of diabetic children decreased and the emotion regulation ability of their mothers was improved by the UP program [22]. Alavi et al. showed the positive effect of the UP method as a short-term procedure to promote the emotion regulation ability of anxious pupils and the parenting methods of their mothers [23]. Their study was also quasi-experimental with a pretest/posttest/follow-up design using a control group. Although the results of the current study are consistent with the findings of previous studies, longitudinal studies are needed to show the effects precisely. García-Escalera et al. showed the effectiveness of the UP method as a prevention program to reduce anxiety and depression in school-aged children. Although reduction in anxiety and depression levels from pre- to post-treatment and follow-up phases occurred, the overall results were not significant [21].

Further studies should be conducted to assess the effects of the UP protocol on other psychological problems such as self-esteem, communication with peers, and self-control. In addition, more studies should be conducted to examine the effects of CIs' coding strategies on perception of emotions and the effect of the age of implantation in children with CI to promote their nonverbal cognitive skills and emotions. Future studies on CIs should be concentrated on complete extraction of fine structures by CIs, increasing the number of implanted electrodes, and improving subjective and objective evaluations in pre- and post-implantation phases, and effective interventional programs to limit their negative effects in children with CI. Furthermore, the effects of bilateral implantation or binaural hearing by bilateral CIs and hearing aids should be evaluated in future studies. The comparison of the effect of UP program between pre-school and school-aged children with CI with respect to their emotion perception is also recommended.

There was scant research about the effect of the UP program on the perception of emotions in people with hearing loss to compare the results. The participants received the intervention online which may affect the quality of the treatment. Due to lack of budget, the intervention took a relatively long time. Future studies should examine the outcome using a larger sample size. The effects of UP program can be compared with those of other interventional approaches. Finally, we cannot generalize the findings to other CI impairments from other areas in Iran, because CI children in each area or city have their own characteristics and even own language.

Conclusion

In general, although the external level is the easiest phase for emotion perception in these children with cochlear implants, our results showed a significant improvement only in the mental and reflective levels, suggesting that the unified protocols can positively improve the emotional perception of these children.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the ethical committee of the Islamic Azad University, Science and Research Branch (Approval ID: IR.IAU.SRB.REC.1399.130). Informed consent forms were given to the parents to sign.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Authors' contributions

MM: Study design, acquisition of data, interpretation of the results, and drafting the manuscript; SG: Study design, supervise the project, and revising the manuscript; BGB: Statistical analysis and revising manuscript; SH: Study design; SV: Revising the manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships.

Acknowledgements

This article has been extracted from M. Mehrdadfar PhD. dissertation on Psychology and Education of Exceptional Children submitted to Science and Research Branch, Islamic Azad University. We would like to show our gratitude to the all parents and their children for their participations in the interventional program. We are also immensely grateful to Z. Ziatabar Ahmadi for her comments to the manuscript.

References

[1] Pons F, Harris PL, de Rosnay M. Emotion comprehension between 3 and 11 years: Developmental periods and hierarchical organization. Eur J Dev Psychol. 2004;1(2):127-52. [DOI:10.1080/17405620344000022]

[2] Mellon NK. Psychosocial development of children in deafness. In: Niparko JK, Kirk KI, Mellon NK, Robbins AM, Tucci DL, Wilson BS, editors. Cochlear Implants: Principles & Practices. 1st ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2000. p. 319-21.

[3] Most T, Aviner C. Auditory, visual, and auditory-visual perception of emotions by individuals with cochlear implants, hearing AIDS, and normal hearing. J Deaf Stud Deaf Educ. 2009;14(4):449-64. [DOI:10.1093/deafed/enp007]

[4] Bararipoor E, Movallali G. [Review of Research on Hearing Impaired Children's Behavioral and Emotional Disorders]. J Rehab Med. 2018;7(3):274-84. Persian

[5] Vavatzanidis NK, Mürbe D, Friederici AD, Hahne A. Establishing a mental lexicon with cochlear implants: an ERP study with young children. Sci Rep. 2018;8(1):910. [DOI:10.1038/s41598-017-18852-3]

[6] Michael R, Attias J, Raveh E. Cochlear Implantation and Social-Emotional Functioning of Children with Hearing Loss. J Deaf Stud Deaf Educ. 2019;24(1):25-31. [DOI:10.1093/deafed/eny034]

[7] Oh SH, Kim CS, Kang EJ, Lee DS, Lee HJ, Chang SO, et al. Speech perception after cochlear implantation over a 4-year time period. Acta Otolaryngol. 2003;123(2):148-53. [DOI:10.1080/0036554021000028111]

[8] Taitelbaum-Swead R, Kishon-Rabin L, Kaplan-Neeman R, Muchnik C, Kronenberg J. [DOI:10.1016/j.ijporl.2005.05.002]

[9] Kishon-Rabin L, Taitelbaum R, Muchnik C, Gehtler I, Kronenberg J, Hildesheimer M. Development of speech perception and production in children with cochlear implants. Ann Otol Rhinol Laryngol Suppl. 2002;189:85-90. [DOI:10.1177/00034894021110S518]

[10] Geier L, Barker M, Fisher L, Opie J. The effect of long-term deafness on speech recognition in postlingually deafened adult CLARION cochlear implant users. Ann Otol Rhinol Laryngol Suppl. 1999;177:80-3. [DOI:10.1177/00034894991080S416]

[11] Carroll J, Zeng FG. Fundamental frequency discrimination and speech perception in noise in cochlear implant simulations. Hear Res. 2007;231(1-2):42-53. [DOI:10.1016/j.heares.2007.05.004]

[12] Ziatabar Ahmadi Z, Mahmoudian S, Ashayeri H. P-MMR and LDN beside MMN as Speech-evoked Neural Markers in Children with Cochlear Implants: A Review. Dev Neuropsychol. 2022;47(1):1-16. [DOI:10.1080/87565641.2021.2004601]

[13] Bouchard ME, Ouellet C, Cohen H. Speech Development in Prelingually Deaf Children with Cochlear Implants. Lang Linguist Compass. 2009;3(1):1-18. [DOI:10.1111/j.1749-818X.2008.00079.x]

[14] Shirvani S, Jafari Z, Sheibanizadeh A, Motasaddi Zarandy M, Jalaie S. Emotional perception of music in children with unilateral cochlear implants. Iran J Otorhinolaryngol. 2014;26(77):225-33.

[15] Bosacki SL, Moore C. Preschoolers' Understanding of Simple and Complex Emotions: Links with Gender and Language. Sex Roles. 2004;50:659-75. [DOI:10.1023/B:SERS.0000027568.26966.27]

[16] Denham SA, Bassett HH, Way E, Mincic M, Zinsser K, Graling K. Preschoolers' emotion knowledge: self-regulatory foundations, and predictions of early school success. Cogn Emot. 2012;26(4):667-79. [DOI:10.1080/02699931.2011.602049]

[17] Rieffe C. Awareness and regulation of emotions in deaf children. Br J Dev Psychol. 2012;30(Pt 4):477-92. [DOI:10.1111/j.2044-835X.2011.02057.x]

[18] Wiefferink CH, Rieffe C, Ketelaar L, De Raeve L, Frijns JH. Emotion understanding in deaf children with a cochlear implant. J Deaf Stud Deaf Educ. 2013;18(2):175-86. [DOI:10.1093/deafed/ens042]

[19] Wang H, Wang Y, Hu Y. Emotional Understanding in Children with A Cochlear Implant. J Deaf Stud Deaf Educ. 2019;24(2):65-73. [DOI:10.1093/deafed/eny031]

[20] Calderon R, Greenberg MT. Social and Emotional Development of Deaf Children: Family, School, and Program Effects. In: Marschark M, Spencer PE. editors. The Oxford Handbook of Deaf Studies, Language, and Education, Volume 1. 2th ed. New York, NY: Oxford University Press; 2011. p. 188-99. [DOI:10.1093/oxfordhb/9780199750986.013.0014]

[21] García-Escalera J, Valiente RM, Sandín B, Ehrenreich-May J, Prieto A, Chorot P. The Unified Protocol for Transdiagnostic Treatment of Emotional Disorders in Adolescents (UP-A) Adapted as a School-Based Anxiety and Depression Prevention Program: An Initial Cluster Randomized Wait-List-Controlled Trial. Behav Ther. 2020;51(3):461-73. [DOI:10.1016/j.beth.2019.08.003]

[22] Ghasemzadeh S, Naghsh Z. Effectiveness of Unified Protocols for Transdiagnostic Treatment in Emotion Regulation of Mothers and Anxiety of Children with Type I Diabetes. Iran Red Crescent Med J. 2020;22(11):e145. [DOI:10.32592/ircmj.2020.22.11.145]

[23] Alavi Z, Ghasemzadeh S, Arjmandnia AA, Gholamali Lavasani M, Vakili S. The effectiveness of Unified Protocol for Transdiagnostic Treatment on emotion regulation in anxious pupils and parenting methods of their mothers. Journal of Psychological Studies. 2022;18(2):21-34.

[24] Schorr EA, Fox NA, Roth FP. Social and emotional functioning of children with cochlear implants: description of the sample. Int Congr Ser. 2004;1273:372-5. [DOI:10.1016/j.ics.2004.08.028]

[25] Melnick H, Cook-Harvey CM, Darling-Hammond L. Encouraging social and emotional learning in the context of new accountability. Palo Alto, CA: Learning Policy Institute; 2017.

[26] Albanese O, Molina PFM. Lo sviluppo della comprensione delle emozioni e la sua valutazione. La standardizzazione italiana del Test di Comprensione ndelle Emozioni (TEC) [The development of emotion understanding and its evaluation.Italian standardization of the Test of Emotion Understanding (TEC)]. 1st ed. Milano, Italy: Edizioni Unicopli; 2008.

[27] Picou EM, Singh G, Goy H, Russo F, Hickson L, Oxenham AJ, et al. Hearing, emotion, amplification, research, and training workshop: Current understanding of hearing loss and emotion perception and priorities for future research. Trends Hear. 2018;22:2331216518803215. [DOI:10.1177/2331216518803215]

[28] De Giacomo A, Craig F, D'Elia A, Giagnotti F, Matera E, Quaranta N. Children with cochlear implants: cognitive skills, adaptive behaviors, social and emotional skills. Int J Pediatr Otorhinolaryngol. 2013;77(12):1975-9. [DOI:10.1016/j.ijporl.2013.09.015]

[29] Majorano M, Maes M, Morelli M, Bastianello T, Guerzoni L, Murri A, et al. Socio-emotional adjustment of adolescents with cochlear implants: Loneliness, emotional autonomy, self-concept, and emotional experience at the hospital. J Child Health Care. 2018;22(3):359-70. [DOI:10.1177/1367493518757065]

[30] Mancini P, Giallini I, Prosperini L, D'alessandro HD, Guerzoni L, Murri A, et al. Level of emotion comprehension in children with mid to long term cochlear implant use: How basic and more complex emotion recognition relates to language and age at implantation. Int J Pediatr Otorhinolaryngol. 2016;87:219-32. [DOI:10.1016/j.ijporl.2016.06.033]