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RESEARCH ARTICLE

The Persian version of infant-toddler meaningful auditory integration scale

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Abstract

Background and Aim: The current study aimed to investigate the validity and reliability of the Persian version of the Infant-Toddler Meaningful Auditory Integration Scale (IT-MAIS) questionnaire. Because cochlear implantation is done today at younger ages, the use of a suitable questionnaire is necessary to evaluate auditory skills and follow up the rehabilitation progress.

Methods: IT-MAIS was translated according to the International Quality of Life Assessment (IQOLA) translation protocol. The content validity was performed using Lawshe method with the participation of 10 expert professionals. The questionnaire was completed for 34 parents of cochlear-implanted children before initial programming of the device, two weeks after the rehabilitation program, and finally three months later. The intraclass correlation coefficient was calculated for test-retest reliability for each IT-MAIS subscale. The internal consistency reliability was analyzed using the Cronbach α coefficient.

Results: The content validity ratio for all items was above 0.79, and the content validity index was obtained to be higher than 0.96. The Cronbach α for the entire questionnaire was 0.74, and for different sections of it was obtained as 0.63–0.67. A significant difference was observed between the total score of the questionnaire before and after the rehabilitation program and its sub-items ($p < 0.001$).

Conclusion: The Persian version of the questionnaire of IT-MAIS is a valid instrument in terms of translation quality as well as reliability and validity for assessing cochlear implant user children who are younger than three years.

Keywords: Reliability; validity; meaningful auditory integration scale; cochlear-implanted children

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Introduction

Evaluating listening skills in pediatric cochlear implant users is crucial to advance proper rehabilitation objectives and follow-up of the extent of improvement in listening skills [1]. Audiologists and speech pathologists always need standard instruments to evaluate the auditory

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perception and speech production in hearing-impaired children, especially cochlear implant users [2]. The linguistic constraints of pre-linguistic deaf children along with their young age complicate performing behavioral tests in this population. The responses of these children are usually very intangible [3,4]. Although most measurements of speech recognition in a controlled environment are used to assess the auditory skills of children with the cochlear implant, these measurements cannot reflect the real performance of the child in daily life [5]. Considering the implantation of cochlear implants under three years, the typical auditory assessments are not possible for them. In addition, some differences are observed in the results expected from auditory perception and language production in these children. Therefore, to obtain information about auditory performance of children at different ages, various instruments and scales such as Meaningful Auditory Integration Scale (MAIS) and Infant-Toddler (IT)-MAIS questionnaires are used [5-7]. MAIS was developed by Robbins et al. in 1991 [8], whose name of the children's version was later changed to IT-MAIS. This instrument provides information about the ability of children in using speech and auditory stimuli through their parents' reports [9]. IT-MAIS is a suitable instrument for evaluating meaningful and auditory integration skills in cochlear implant users younger than three years. The assessment designed to measure listening skills in children aged 0–3 years. This questionnaire has a kind of interview structure with parents, thereby preventing interference of the response of parents' interest in the performance of the child [10,11]. IT-MAIS has shown successful results for assessing child responses in three areas: vocalization behaviors, alerting to sounds, and deriving meaning from the sound. IT-MAIS has high reliability and internal consistency and also has a high correlation with phonetically balanced-kindergarten in an open set [10]. The reliable and valid version of this questionnaire is used in many languages [1,6,12-15]. The excellent feature of this scale is linguistic independence. This questionnaire is used to monitor the progress of auditory skills in children with cochlear implant. In Persian, often two scales are used to determine the progress of the rehabilitation program in cochlear-implanted children; the Categorization of Auditory Performance (CAP) to evaluate the receptive skills and auditory perception [16], and Speech Intelligibility Rating (SIR) to assess the extent of verbal clarity [2,17]. These two scales are used for children older than three years.

Due to lack of a suitable Persian instrument to compare the auditory performance before and after cochlear implantation for children younger than three years, it is necessary to prepare a valid instrument representing the auditory skills function of the child which is also generalizable to all daily life situations. In this way, one can evaluate and follow-up the course of rehabilitation and its progress [18]. Accordingly, the present study aimed to prepare the Persian version of the IT-MAIS questionnaire and determine the psychometric characteristics as well as its preliminary assessment in cochlear-implanted children after the rehabilitation program.

Methods

This descriptive psychometric study consisted of two sections. First, the translation, adaptation, and investigation of the content and face validity of the questionnaire and then fill in the questionnaire to determine its internal and intraclass correlation. The preliminary assessment of questionnaire was done three months after the rehabilitation by interviewing 34 parents of the children with cochlear implants in the cochlear implantation centers of Rasul Akram and Amir Alam hospitals. A total of 34 children (19 male, 15 female) with bilateral severe to profound sensorineural hearing loss participated in this study. All of them had congenital hearing loss. The mean ± SD age of the implanted children was 29.6 ± 6.3 months (range: 16–35 months). The rehabilitation approach was auditory-verbal therapy for all children.

Translation and adaptation of the questionnaire

The Persian version of the IT-MAIS was translated according to the International Quality of

Life Assessment (IQOLA) translation protocol [19]. After acquiring permission from the developer, the questionnaire was translated by two expert translators independently. To investigate the similarity between the translated questionnaire and the original version, the Persian version was back-translated to English by two other translators. For content matching, it was sent to the main author, and his confirmation was received.

Content validity

To investigate the content validity ratio (CVR) based on Lawshe method, the Persian version of the questionnaire was presented to 10 audiologists to state their opinion about the items as "essential," "useful but not essential," and "not essential." Furthermore, to examine the content validity index (CVI) using Waltz and Basel method, the experts specified "relevancy," "clarity," and "simplicity" of each item based on a 4-point Likert scale. The necessary corrections of interest by experts about content validity and translation were applied to the questionnaire.

Face validity

The face validity of the questionnaire was examined both quantitatively and qualitatively by 10 audiologists and 10 parents of cochlear-implanted children. The corrective comments of experts about face validity were applied to the questionnaire. The item impact was determined based on the number of participants who identified it as important, and the mean importance score attributed to this item (impact score = frequency × importance). Also, the experts and parents scored each item of the questionnaire based on two indexes of being reasonable and acceptable, according to a 6-point Likert scale.

Implementation of questionnaire and reliability

A total of 34 parents of cochlear-implanted children younger than three years participated in this study. The children did not have any other disorders or disabilities. The written informed consent form was taken from all parents. The questionnaire was filled on the first day before the switch on the speech processor device in the cochlear implant center. The questions of the questionnaire were presented to the parents in an interview-like approach, and the proper score was registered by the researcher based on the description of parents about the child's behavior.

Scoring

The questionnaire consisted of 10 items; 2 items associated with vocalization behaviors, 4 items associated with alerting to sounds, and 4 items related to deriving meaning from sounds. The score of each item ranged from 0 to 4, given the degree to which each of the behaviors was observed (never = 0, rarely = 1, sometimes = 2, most of the time = 3, and always = 4). The maximum score of the questionnaire was 40.

Reliability

To investigate the test-retest reliability, the questionnaire was filled up again for all parents two weeks later, before beginning the rehabilitation classes for the children.

Evaluating the effectiveness of rehabilitation

In order to do a preliminary study of the Persian version of IT-MAIS, three months after the rehabilitation programs, the questionnaire was administered to all parents of children participating in the research.

Statistical analysis was performed in SPSS 22.0. CVR index was used to evaluate the content validity using Lawshe method. Item impact method was applied to assess face validity. The intraclass correlation coefficient (ICC) index was used to investigate the test-retest reliability. The Cronbach α was calculated to check the internal consistency. The Shapiro-Wilk statistic was used to test the normality of the distribution of all variables. Considering the abnormal data distribution, the Wilcoxon test was used to compare the scores of the questionnaire before the rehabilitation program and three months after it. This research has received an Ethical code from the University of Social Welfare and Rehabilitation Sciences (IR.USWR.REC.1396.

Table 1. Content validity ratio and content validity index based on "relevancy", "clarity", and "simplicity" for each of the questionnaire items

		CVI		
Item	**CVR**	**Relevancy**	**Clarity**	**Simplicity**
1	1	1	1	0.9
2	0.8	1	0.9	0.9
3	1	1	1	1
4	1	1	0.9	0.9
5	1	1	1	1
6	1	1	1	1
7	0.8	1	1	1
8	1	1	1	0.9
9	1	1	0.9	1
10	0.8	1	1	1
Average	8.68	1	0.97	0.96

CVI; content validity index, CVR; content validity ratio

394) conducted between February 2018 and August 2018.

Results

Following the process of translation into Persian, the results of investigating the psychometric properties of the questionnaire were obtained as the following.

Content validity

Table 1 presents the results of the CVR for each questionnaire item. The minimum acceptable CVR value according to the number of experts participating in this research (10 experts) was 0.62. As seen in Table 1, in all items, the CVR value is above 0.79, suggesting excellent CVR of the questionnaire items. It should be noted that the content validity ratio for the second and seventh items was initially less than the acceptable value. After applying the corrective comments of experts for these two items, the required score was obtained.

The results of the content validity index (CVI) for each item of the questionnaire based on the three items of relevancy, clarity, and simplicity are presented in Table 1. Given that the acceptable CVI for each question should be more than 0.79, the results showed that all of the items had an appropriate CVI.

Face validity

In the assessment of face validity based on impact score, all of the statements received at least 1.5 or higher points. The results of the evaluation of the face validity by experts and parents based on a 6-point Likert scale are shown in Fig. 1. As can be seen, the mean of the total scores of the questionnaire has been higher than 5 for both being reasonable and acceptable items.

Reliability

In this study, the reliability of the questionnaire was examined by determining ICC and internal consistency using the Cronbach α. The results of test-retest by implementing the questionnaire within a two-week interval indicated a significant correlation between the results ($p < 0.00$, ICC = 0.96).

The Cronbach α coefficient for the total questionnaire was 0.74, and for "vocalization behaviors," "alerting to sounds," and "deriving meaning from sound" subscales were obtained as 0.66, 0.63, and 0.67, respectively. The results of the Spearman correlation coefficient for examining the correlation of subscales with the whole questionnaire were as follows: vocalization behaviors ($r = 0.73$, $p < 0.001$), alerting to sounds ($r = 0.64$, $p < 0.01$), and deriving meaning from sound ($r = 0.62$, $p < 0.01$).

Comparing the scores before and after rehabilitation

The results of the mean and standard deviation of the total scores of the questionnaire and its subscales before and three months after the rehabilitation program are shown in Table 2. Comparison of the total score of the questionnaire and each of its subscales using the Wilcoxon tests showed a significant difference

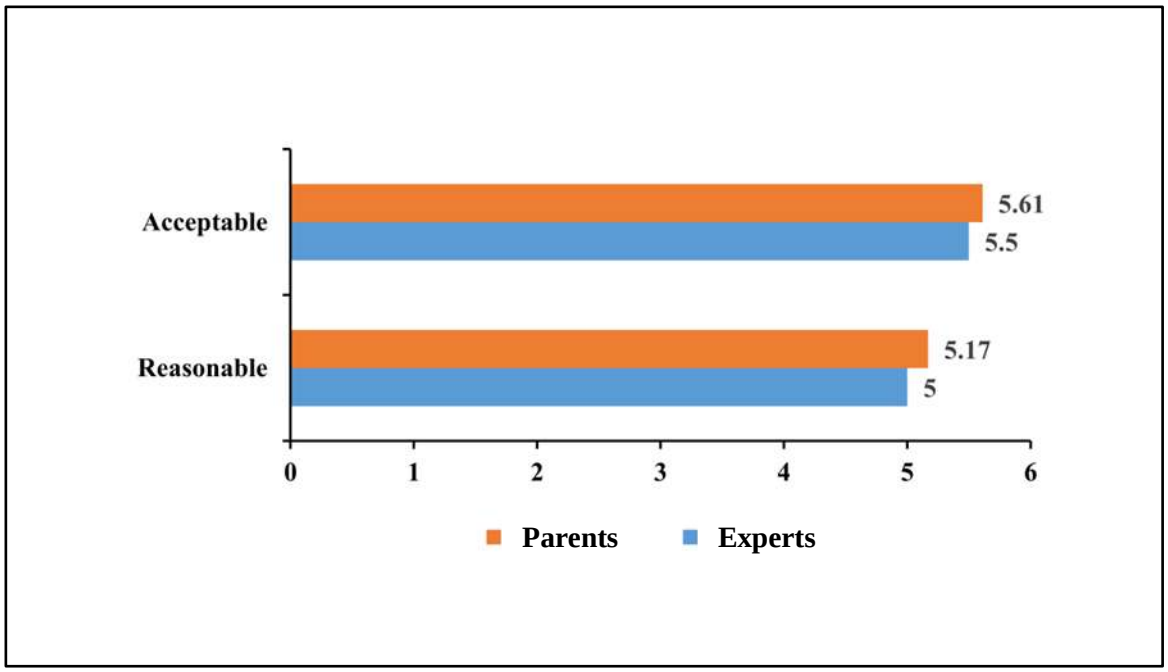

Fig 1. The mean scores of the experts (n = 10) and parents (n = 10) to items based on being reasonable and acceptable.

between the score of the questionnaire and each of the subscales before and after the rehabilitation program ($p < 0.001$).

Discussion

A valid instrument is required to investigate the auditory and speech skills of children younger than three years, especially for assessing cochlear-implant candidacy and monitoring their progress. This research investigated the reliability and validity of the Persian version of IT-MAIS. In previous studies, different methods have been used for translation and culture adaptation of this questionnaire into different languages [13,20,21]. In our study, the IT-MAIS questionnaire was translated into Persian based on the IQOLA translation protocol. Investigation of the CVR with the participation of 10 experts and using Lawshe method indicated that all of the items of the questionnaire had a good content validity ratio (higher than 0.79). Furthermore, CVI using Waltz and Basel method for each item of the questionnaire based on the three criteria of "relevancy," "clarity," and "simplicity" was obtained as above 0.96, suggesting the excellent quality of translation and content validity.

The results showed that the Persian version of the questionnaire had a suitable intraclass correlation (ICC = 0.96, 95% CI = 0.93–0.98). The results of Cronbach α (0.74) represented acceptable reliability and internal consistency of the items of the questionnaire. Zhong et al. examined the psychometric properties of the IT-MAIS questionnaire in Chinese. The results of ICC and Cronbach α of the entire questionnaire were 0.92 and 0.83, respectively. Furthermore, the Cronbach α was obtained for each item of "vocalization behaviors" (0.88), "alerting to sounds" (0.76), and "deriving meaning from sound" (0.74) [20]. The result of another study to determine the psychometric properties of IT-MAIS in Italian showed good intraclass reliability (ICC = 0.93). Moreover, the total Cronbach α was 0.91 and for each part of the "alerting to sounds" and "deriving meaning from sound" was obtained as 0.76 and 0.74, respectively, suggesting suitable internal content correlation in the questionnaire [21]. The results of the study by Zimmerman et al. on 9 infants

Table 2. Comparison of the total scores of the questionnaire and its subscales, before and three months after rehabilitation for 34 patients (mean age = 29.6 month)

	Mean (SD) score		
Subscales	**Before the rehabilitation**	**After the rehabilitation**	**p**
Vocalization behaviors	0.76 (1)	5.5 (0.89)	< 0.001
Alerting to sounds	0.64 (0.88)	10.4 (0.89)	< 0.001
Deriving meaning from sound	0.44 (0.92)	9.7 (1.1)	< 0.001
Total	1.85 (2.2)	25.7 (2.3)	< 0.001

aged 18–23 months before and after three months following cochlear implantation suggested high reliability as well as the high correlation between this questionnaire and other tests [10].

The results of comparing the scores of the Persian version of the questionnaire before and three months after the rehabilitation program showed a significant difference between the total scores and all of its subscales ($p < 0.001$). This finding is in line with previous studies comparing the results of the implementation of the questionnaire before and after rehabilitation in different periods [11,6].

Zimmerman et al. in a study to evaluate the advantages of cochlear implantation in children reported that all children received zero-point scores in all parts of the questionnaire before cochlear implant surgery, and their parents had not observed any vocalization behaviors or auditory behavior. Three months after the cochlear implantation, an improvement was seen in at least 7 items out of 10 items of the questionnaire in all participants. The results of their study showed that IT-MAIS is a useful instrument for examining and determining the process of improving auditory and speech skills [10]. Robbins et al. examined the effect of age of cochlear implantation on improving the auditory skills of children under three years of age using the IT-MAIS questionnaire. The children were categorized in terms of age of cochlear implantation into three groups: 12–18, 19–23, and 24–36 months old. The performance of these three groups was assessed before implantation as well as 3 and 6 months after cochlear implantation. They found that the IT-MAIS score for all of the three groups before cochlear implantation was close to zero. Following surgery and use of the rehabilitation program, their score increased dramatically. There was no significant difference between the scores of the first and second groups, but the children in the third group obtained lower scores [6]. The results of their study were in line with the current research. These results suggest the usefulness of the IT-MAIS questionnaire as an instrument for investigating progress in auditory and speech skills of children younger than three years.

Conclusion

Investigation of the reliability and validity of the Persian version of Infant-Toddler Meaningful Auditory Integration Scale indicated that the questionnaire had good translation quality. Furthermore, the questionnaire possessed high content validity and reliability. This questionnaire can be a good instrument for investigating the progress of auditory and speech skills in very young children. The present questionnaire individually assesses three different areas of the spontaneous behaviors of children. Therefore, the progress of children in all three areas in the rehabilitation program can be individually evaluated.

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Conflict of interest

The authors declared no conflicts of interest.

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