

Translation and evaluation the validity and reliability of the Persian version of the Children's Home Inventory for Listening Difficulties questionnaire (CHILD)

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Highlights:

- The Persian CHILD questionnaire showed excellent reliability
- Exploratory factor analysis supported a one-factor structure
- The Persian CHILD is suitable for screening listening difficulties in preschoolers.

Abstract

Background: Early identification of auditory processing difficulties in preschool children is essential for preventing subsequent communication and academic problems. The Children's Home Inventory for Listening Difficulties (CHILD) is a parent-report measure developed to evaluate children's listening behaviors in everyday home environments. This study aimed to examine the validity and reliability of the Persian version of the CHILD questionnaire.

Methods: In this cross-sectional psychometric study, 105 Persian-speaking preschool children aged 3–6 years with normal peripheral hearing were recruited. Face and content validity were assessed by an expert panel. Construct validity was evaluated using exploratory factor analysis. Internal consistency and test–retest reliability were assessed using Cronbach's alpha and the intraclass correlation coefficient (ICC), respectively. Nonparametric analyses were performed to examine the effects of age and gender on questionnaire scores.

Results: Face and content validity indices were acceptable. One item was removed because of an inadequate content validity ratio. Exploratory factor analysis supported a one-factor structure (Kaiser–Meyer–Olkin (KMO)=0.895; Bartlett's test: $\chi^2=891.351$, $p<0.001$), explaining 53.52% of the total variance. The final 14-item version demonstrated excellent internal consistency (Cronbach's $\alpha=0.928$) and test–retest reliability (ICC=0.966,

$p < 0.001$). No significant differences were observed across gender ($p = 0.851$) or age groups ($p = 0.600$). In addition, no significant correlation was found between age and total questionnaire score ($r = -0.053$, $p = 0.593$).

Conclusion: The Persian CHILD questionnaire demonstrated satisfactory validity and excellent reliability. The instrument may be used as a practical screening tool for identifying auditory processing difficulties in Persian-speaking preschool children in both clinical and research settings.

Keywords: Central Auditory Processing Disorder; Screening; Children; Questionnaire; listening difficulty

Introduction

Listening is a complex process that involves not only the detection of acoustic signals but also the efficient processing and interpretation of auditory information by the central auditory nervous system [1,2]. Hearing is closely related to cognitive resources, listening effort, and language understanding [3]. Difficulties in auditory processing may negatively affect language development, communication skills, academic performance, and social participation in children [4,5,6].

Auditory Processing Disorder (APD) refers to deficits in the perceptual processing of auditory information within the central auditory nervous system and the neurobiological activity underlying this processing [7,8]. Children with APD often experience difficulties understanding speech in noisy environments, following verbal instructions, maintaining attention during listening tasks, and discriminating auditory information despite having normal peripheral hearing sensitivity [9,10].

Early identification of listening difficulties is essential because undetected auditory processing problems may contribute to language delays, educational challenges, and behavioral difficulties [11,12]. However, comprehensive diagnostic assessment of APD is often time-consuming and requires specialized clinical facilities. Therefore, screening instruments play an important role in identifying children who require comprehensive auditory processing assessment [13,14].

Several questionnaires have been developed for screening auditory processing difficulties in children. Examples include CHAPS [15], Fisher's Auditory Problems Checklist [16], SIFTER [17], APDQ [18], ECLiPS [19], and other parent- or teacher-report measures.

Recently, increasing attention has been directed toward the development and psychometric validation of auditory processing screening and assessment instruments for preschool children. Liu et al. developed and validated a preschool auditory processing assessment scale in China and reported satisfactory reliability, validity, and normative data, highlighting the growing need for valid and reliable screening tools for the early identification of auditory processing difficulties in preschool children [20]. Among these instruments, the CHILD questionnaire is specifically designed to assess listening behaviors in the home environment through parental reports [21]. Because parents observe their children in a wide range of daily listening situations, their observations provide important information regarding functional listening performance and potential auditory processing difficulties [22].

The CHILD questionnaire has been translated and psychometrically evaluated in different languages and populations, demonstrating satisfactory validity and reliability [23,24,25]. However, before the present study, no validated Persian version of this instrument was available for use among Persian-speaking preschool children.

Therefore, the aim of the present study was to translate, culturally adapt, and evaluate the psychometric properties of the Persian version of the CHILD questionnaire in preschool children aged 3–6 years.

Methods

1. Study Design

This methodological study was conducted to translate, culturally adapt, and evaluate the psychometric properties of the Persian version of the Children's Home Inventory for Listening Difficulties (CHILD) questionnaire.

2. Participants

A total of 105 Persian-speaking preschool children aged 3–6 years participated in the main psychometric evaluation of the Persian CHILD questionnaire. Participants were recruited using convenience sampling. The sample consisted of 46 girls (43.8%) and 59 boys (56.2%). Participants were categorized into three age groups: 31 children aged 3–4 years, 28 children aged 4–5 years, and 46 children aged 5–6 years.

The sample of 105 children constituted the main study sample for the evaluation of the psychometric properties of the questionnaire. To assess test–retest reliability, a subgroup of 30 participants from the main study sample completed the questionnaire again after a two-week interval.

The inclusion criteria were: (1) Persian-speaking monolingual children, (2) age between 3 and 6 years, (3) normal peripheral hearing sensitivity with hearing thresholds below 20 dB HL, (4) absence of neurological disorders, (5) parents with at least a high-school education and adequate communication skills, and (6) provision of written informed consent. Participants were excluded if either the child or parents were unwilling to continue participation in the study.

3. Instruments

Data were collected using a demographic questionnaire, pure-tone screening audiometry, and the Persian-translated CHILD questionnaire. The demographic questionnaire collected information on the children's demographic and clinical characteristics, including age, sex, medical and developmental history, pregnancy- and birth-related factors, and visual problems. In addition, information on parental educational level and family history of auditory processing and language disorders was obtained. Pure-tone air-conduction screening audiometry was performed at preschool centers using an ASA94 screening audiometer across frequencies from 250 to 8000 Hz. Hearing thresholds ≤ 20 dB HL at all test frequencies were considered indicative of normal peripheral hearing sensitivity. The CHILD questionnaire is a parent-report instrument designed to assess children's listening difficulties in everyday home environments. Following the translation and cultural adaptation process and expert content evaluation, one item was removed from the Persian version. The final Persian version consisted of 14 items.

4. Translation and cultural adaptation

The translation and cultural adaptation of the CHILD questionnaire were conducted according to established principles for the cross-cultural adaptation of self-report and parent-report instruments [26,27]. The translation process followed the International Quality of Life Assessment protocol. Two independent native Persian-speaking translators, who were experienced in English–Persian translation and blinded to the questionnaire, independently performed the forward translation. After reconciliation of the two translations through discussion among the translators and the research team, a single preliminary Persian version was developed. This version was then independently back-translated into English by two bilingual translators who were not involved in the forward translation. The back-translated versions were reviewed by the translators and the research team, and a consensus English version was prepared. Finally, the back-translated version was submitted to the original developer for review and approval. Following this process, the final Persian version of the CHILD questionnaire was established for psychometric evaluation.

The questionnaire was translated into Persian and subsequently reviewed for linguistic clarity and cultural appropriateness. During the expert evaluation, the content of each item was assessed in relation to the construct targeted by the questionnaire.

Item 8 was removed based on the conceptual evaluation of the expert panel. Although the item was considered understandable and related to the broader domain of listening, the majority of experts judged that its content primarily reflected basic hearing ability rather than auditory processing or functional listening difficulties. Therefore, the item was considered conceptually inconsistent with the construct targeted by the CHILD questionnaire. Since the experts did not propose an alternative wording that would adequately represent the intended construct, the item was removed without replacement.

5. Face and content validity

Face validity was evaluated quantitatively using the impact score method. The simplicity, clarity, and importance of each item were assessed by an expert panel. Content validity was evaluated using the Content Validity Ratio (CVR) based on Lawshe's method and the Content Validity Index (CVI) according to the approach described by Waltz and Bausell. Thirteen audiologists and speech-language pathologists participated in the expert panel. The I-CVI and CVR of each item were calculated. Items were evaluated based on their relevance and essentiality to the construct of functional listening difficulties. Item 8 was excluded because its content was judged by the expert panel to primarily reflect hearing ability rather than auditory processing or functional listening difficulties, and its CVR did not meet the predefined criterion.

6. Construct validity

Construct validity was assessed using exploratory factor analysis with principal axis factoring. Sampling adequacy was evaluated using the KMO measure, and Bartlett's test of sphericity was used to determine the suitability of the data for factor analysis. The factor structure was examined using the eigenvalues and scree plot. Factor loadings were evaluated to determine the contribution of the retained items to the underlying construct.

7. Reliability

Internal consistency was assessed using Cronbach's alpha coefficient. Test-retest reliability was evaluated using the intraclass correlation coefficient (ICC). A subgroup of 30 parents completed the Persian CHILD questionnaire twice with a two-week interval between administrations. A subsample of 30 participants was included in the test-retest analysis, consistent with recommendations for psychometric studies indicating that 20–50 participants are generally adequate for reliability assessment using the intraclass correlation coefficient (ICC) [28]. A two-way mixed-effects model with absolute agreement was used to calculate the ICC.

8. Statistical analysis

Data analysis was performed using SPSS version 17. Normality of data distribution was assessed using skewness, kurtosis, and the Kolmogorov–Smirnov test. Because the data were not normally distributed, nonparametric statistical tests were used. Mann–Whitney U test was employed to compare questionnaire scores between boys and girls. Kruskal–Wallis test was used to compare scores among age groups. Spearman correlation coefficient was calculated to evaluate the relationship between age and total questionnaire score. A significance level of $p < 0.05$ was considered statistically significant.

There were no missing data in the dataset; therefore, no imputation method was required.

Results

1. Face validity

Quantitative face validity evaluation demonstrated that more than 80% of experts rated the questionnaire items as simple or very simple. Similarly, more than 80% of experts considered the items clear or very clear. All questionnaire items achieved impact scores greater than 1.5, indicating acceptable item importance and satisfactory face validity.

2. Participant characteristics

A total of 105 children aged 3–6 years participated in the study. The demographic characteristics of the participants are presented in Tables 1.

3. Content validity

Content validity analysis showed that all questionnaire items demonstrated acceptable CVI values above the recommended threshold of 0.79. However, Item 8 obtained a CVR value below the acceptable Lawshe criterion (0.54) and was therefore removed from the questionnaire. Consequently, the final Persian version of the CHILD questionnaire consisted of 14 items.

4. Construct validity

The KMO measure of sampling adequacy was 0.895, indicating excellent suitability of the data for factor analysis. Bartlett's test of sphericity was statistically significant ($\chi^2 = 891.351$, $df = 91$, $p < 0.001$), confirming the presence of adequate inter-item correlations. Exploratory factor analysis identified a single factor with an eigenvalue greater than 1 (Eigenvalue = 7.493). This factor explained 53.52% of the total variance. As shown in Figure 1, the scree plot demonstrated a distinct break after the first factor, supporting the retention of a single-factor solution. Therefore, the Persian version of the CHILD questionnaire demonstrated a single-factor construct.

The pattern matrix is presented in Table 2. All questionnaire items demonstrated acceptable factor loadings on the extracted factor, supporting the unidimensional structure of the Persian version of the CHILD questionnaire.

5. Reliability

The final 14-item Persian version demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.928. Test-retest reliability was also excellent. The intraclass correlation coefficient was 0.966 ($p < 0.001$), indicating outstanding temporal stability over the two-week interval.

6. Gender differences

Mann-Whitney U test revealed no significant difference in total questionnaire scores between boys and girls ($U = 1328.50$, $Z = -0.188$, $p = 0.851$).

7. Age group comparisons

Kruskal-Wallis analysis showed no significant differences in CHILD questionnaire scores among the three age groups ($H = 1.023$, $df = 2$, $p = 0.600$).

8. Correlation between age and CHILD scores

Spearman correlation analysis demonstrated no significant relationship between age and total CHILD score ($r = -0.053$, $p = 0.593$).

A summary of the descriptive statistics, reliability, and construct validity indices of the Persian version of the CHILD questionnaire is presented in Table 3.

Discussion

The present study aimed to translate, culturally adapt, and evaluate the psychometric properties of the Persian version of the CHILD questionnaire in Persian-speaking preschool children. Overall, the findings demonstrated acceptable face and content validity, a clear unidimensional factor structure, and excellent internal consistency and test-retest reliability. These findings support the potential use of the Persian CHILD as a parent-report screening instrument for identifying functional listening difficulties in preschool children. However, as the questionnaire is a screening tool, the findings should not be interpreted as evidence that the instrument can independently diagnose auditory processing disorder.

The face validity findings indicated that the translated items were considered clear, simple, and important by the expert panel. This suggests that the linguistic adaptation preserved the comprehensibility of the original questionnaire and that the items were generally appropriate for the intended population. This aspect is particularly important for parent-report instruments, as unclear or linguistically complex items may introduce measurement error and reduce the accuracy of parental responses. The acceptable face validity observed in the present study is consistent with the general principles of cross-cultural adaptation, which emphasize linguistic clarity and cultural relevance during the adaptation of patient- or parent-reported instruments [26,27].

Regarding content validity, all items demonstrated acceptable I-CVI values. However, Item 8 did not meet the minimum acceptable CVR criterion and was therefore removed. Interestingly, although the I-CVI of this item was acceptable, its CVR was substantially below the predefined threshold. This discrepancy may indicate that

the item was considered relevant to the general content of listening difficulties but was not consistently judged by the experts as an essential component of the construct. Such differences between CVI and CVR are methodologically important because these indices assess different aspects of content validity. The removal of Item 8 may also reflect linguistic or cultural differences in the interpretation of a specific listening behavior among Persian-speaking families. Previous cross-cultural adaptations of health and behavioral questionnaires have similarly demonstrated that individual items may require modification or removal despite the overall conceptual equivalence of the instrument [26,27]. Nevertheless, the potential impact of removing this item on content coverage should be considered in future studies using larger expert panels and clinical samples.

The exploratory factor analysis supported a one-factor structure for the Persian CHILD questionnaire. The excellent KMO value and significant Bartlett's test indicated that the correlation matrix was suitable for factor analysis. The extracted factor explained 53.52% of the total variance, and the scree plot demonstrated a clear break after the first factor. These findings support the interpretation that the Persian CHILD primarily assesses a common underlying construct related to functional listening difficulties in the home environment. The unidimensional structure is also conceptually consistent with the original purpose of the CHILD questionnaire, which was designed to capture parent-observed listening behaviors in everyday situations. However, because the present study relied exclusively on exploratory factor analysis, the one-factor structure should be considered preliminary. A confirmatory factor analysis in an independent and larger sample is required to further verify the stability of this structure.

The Persian CHILD demonstrated excellent internal consistency, with a Cronbach's alpha coefficient of 0.928, indicating a high degree of homogeneity among the questionnaire items. This finding is broadly consistent with previous cross-cultural adaptations of the CHILD questionnaire. The Turkish version reported an exceptionally high internal consistency (Cronbach's $\alpha = 0.990$), whereas the Polish adaptation demonstrated a Cronbach's alpha of 0.930, supporting the reliability of the instrument for identifying listening difficulties in children [23,24]. Similarly, recent adaptation into Korean (Cronbach's $\alpha = 0.960$) has also reported satisfactory psychometric properties [25], further supporting the cross-cultural applicability of the CHILD questionnaire across linguistically and culturally diverse populations. Collectively, these findings suggest that the CHILD questionnaire maintains robust internal consistency regardless of language or cultural context.

The high internal consistency observed in the present study indicates that the items of the 14-item Persian version measure a coherent underlying construct related to children's listening difficulties in everyday environments. However, although a high Cronbach's alpha reflects strong inter-item consistency, it should not be interpreted as evidence of construct validity by itself. Cronbach's alpha is influenced by both the number of items and the degree of inter-item correlation. Therefore, the excellent internal consistency observed in the present study should be interpreted alongside the evidence of construct validity, including the one-factor structure identified through exploratory factor analysis and the excellent test-retest reliability demonstrated by the Persian version.

Test-retest reliability was also excellent, with an ICC of 0.966 over a two-week interval. This finding indicates a high level of temporal stability and suggests that the questionnaire produces consistent scores when administered to the same respondents over a relatively short period. The observed ICC is particularly relevant for a screening questionnaire intended for clinical and research applications. However, the possibility of recall or learning effects cannot be completely excluded in a two-week test-retest design. Future studies may benefit from examining the stability of CHILD scores over longer intervals and in samples with clinically confirmed listening difficulties.

The present study did not identify significant differences in CHILD scores between boys and girls or among the three age groups. In addition, no significant correlation was observed between age and total questionnaire score. These findings suggest that, within the 3–6-year age range examined in this study, parent-reported listening behaviors measured by the CHILD may remain relatively stable across age and sex. This finding may be advantageous for the practical use of the questionnaire during the preschool period, as it suggests that age- or sex-specific interpretation may not be immediately necessary within this particular age range. However, the absence of statistically significant differences should be interpreted cautiously. The present study was not designed to establish measurement invariance across age or sex, and the sample included only children with normal peripheral hearing. Therefore, these results should not be interpreted as definitive evidence that the questionnaire functions identically across all demographic groups.

The psychometric findings of the present study are generally consistent with previous international adaptations of the CHILd questionnaire. The agreement between the Persian version and previous Turkish and Polish versions regarding the overall reliability and usefulness of the instrument supports the cross-cultural robustness of the CHILd questionnaire [23,24]. However, the differences in the number of retained items and the observed factor structure across adaptations also highlight the importance of evaluating each translated version independently rather than assuming complete psychometric equivalence between language versions. Cultural and linguistic factors may influence how parents understand and report specific listening behaviors.

From a clinical perspective, the Persian CHILd may provide useful information regarding listening behaviors that are not necessarily identified through conventional peripheral hearing assessment. This is particularly relevant because the children in the present study had normal peripheral hearing, whereas functional listening difficulties may occur despite normal pure-tone thresholds [9,10]. A parent-report questionnaire may therefore serve as a practical first-stage screening instrument and help identify children who require more comprehensive auditory or developmental assessment. However, the Persian CHILd should be used as part of a broader assessment process and should not replace a comprehensive evaluation of auditory processing, language, cognition, and related developmental factors.

Several limitations should be acknowledged. First, participants were recruited using convenience sampling, which may limit the generalizability of the findings to the wider population of Persian-speaking preschool children. Second, the study included only children with normal peripheral hearing and did not include a clinical group with confirmed auditory processing disorder, hearing loss, or language and developmental disorders. Therefore, the diagnostic or discriminative performance of the Persian CHILd could not be evaluated. Third, confirmatory factor analysis was not performed; therefore, the one-factor structure identified through exploratory factor analysis requires further confirmation in an independent sample. Fourth, convergent and discriminant validity were not assessed because the Persian CHILd was not compared with other established instruments measuring similar or theoretically distinct constructs. Finally, the absence of comparison with a similar screening instrument limits the interpretation of the questionnaire's relative validity. Future studies should address these limitations by recruiting larger and more representative samples, including clinical populations, conducting CFA and measurement invariance analyses, and evaluating convergent, discriminant, and criterion-related validity.

Conclusion

The Persian version of the CHILd questionnaire demonstrated acceptable face and content validity, a clear unidimensional factor structure, and excellent internal consistency and test-retest reliability in Persian-speaking preschool children aged 3–6 years. The findings suggest that the Persian CHILd is a promising parent-report screening instrument for identifying functional listening difficulties in preschool children with normal peripheral hearing.

Nevertheless, the questionnaire should be interpreted as a screening instrument rather than a standalone diagnostic tool for auditory processing disorder. Further studies involving larger and more representative samples, clinical populations, confirmatory factor analysis, and additional validity assessments are required to establish the broader clinical applicability and diagnostic utility of the Persian CHILd questionnaire.

Ethical Considerations

This study was approved by the Ethics Committee of Iran University of Medical Sciences (IR.IUMS.REC.1404.078). Written informed consent was obtained from all parents before participation in the study.

Authors' contribution

MT: Study design, acquisition of data, statistical analysis, interpretation of the results, and drafting the manuscript; NR: Study design, supervision of the study, interpretation of the results, critical revision of the manuscript, and final approval of the manuscript; SJS: Statistical analysis, interpretation of the results, critical revision of the manuscript, and final approval of the manuscript.

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Table 1. Demographic characteristics of the participating children and parental educational level (n = 105)

Variable	Category	n	%
Age (years)	3–4	31	29.5
	>4–5	28	26.7
	>5–6	46	43.8
Sex	Female	46	43.8
	Male	59	56.2
Hand dominance	Right-handed	88	83.8
	Left-handed	17	16.2
Parental education	Diploma	52	50.0
	Associate degree	3	2.9
	Bachelor's degree	23	21.9
	Master's degree	16	15.2
	Doctorate	11	10.5

Table 2. Content validity and exploratory factor analysis of the Persian version of the CHILD questionnaire

Item	CVR	I-CVI	Content validity decision	Factor loading
Television	0.84	1.00	Retained	0.82
Conversation with another adult	0.69	1.00	Retained	0.80
Conversation with another child at home	0.84	1.00	Retained	0.79
Asking the child in a store	0.69	1.00	Retained	0.79
Conversation with the child in the car	0.69	1.00	Retained	0.77
Conversation with the child from a distance	0.69	1.00	Retained	0.74
Asking the child during play	0.84	1.00	Retained	0.73
Hearing an alarm clock / waking to a voice without physical prompting (Item 8)	-0.08	0.92	Removed	—
Restaurant	0.69	1.00	Retained	0.72
Telephone	0.84	1.00	Retained	0.71
Telephone conversation	0.69	1.00	Retained	0.71
Conversation with the child before bedtime	0.69	1.00	Retained	0.70
Talking with the child while watching television	0.69	1.00	Retained	0.63
Conversation with other children in a noisy environment	0.69	1.00	Retained	0.59
Conversation with other children in an open space	0.84	1.00	Retained	0.54

*CVR = Content Validity Ratio; I-CVI = Item-level Content Validity Index.

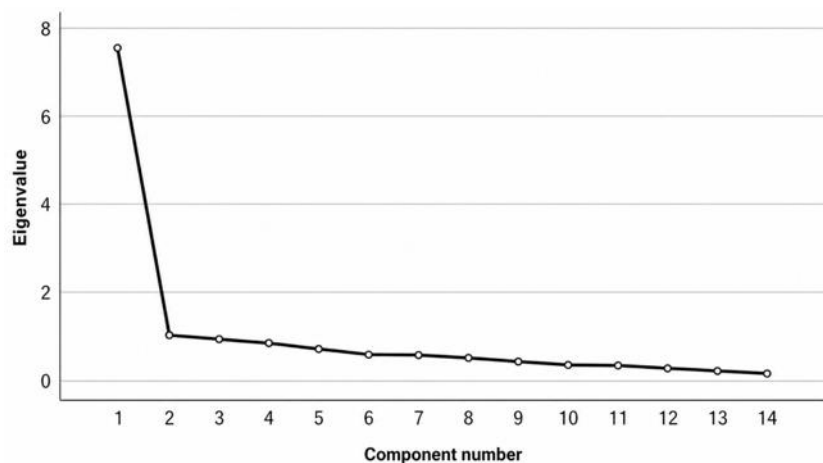


Figure 1. Scree plot of the exploratory factor analysis of the Persian version of the CHILD questionnaire. The plot demonstrates a clear break after the first factor, supporting a unidimensional factor structure

Table 3. Descriptive statistics, reliability, and construct validity indices of the Persian version of the CHILD questionnaire

Measure	Statistic	Value	p-value
Descriptive statistics	Mean $\pm$ SD	106.10 $\pm$ 8.19	—
	Median (IQR)	109 (8)	—
	Minimum–Maximum	57–112	—
Internal consistency	Cronbach's alpha	0.928	—
Test–retest reliability	ICC (95% CI)	0.966 (0.930–0.984)	<0.001
Gender comparison	Mann–Whitney U	1328.50	0.851
Age-group comparison	Kruskal–Wallis H (df = 2)	1.023	0.600
Correlation with age	Spearman's rho	–0.053	0.593

*SD = standard deviation; ICC = Intraclass Correlation Coefficient; CI = confidence interval; IQR = interquartile range.