



Original Article

Translating and Assessing the Validity and Reliability of Persian Version of the International Outcome Inventory for Hearing Aids (IOI-HA)

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ABSTRACT

Background: The aim of this paper was to prepare the Persian version of the unique International Edition of the self-report Hearing Aids questionnaire and to assess its validity and reliability. This questionnaire was chosen because of its simplicity, comprehensiveness for users, and usefulness, in comparison with other evaluations of outcomes hearing aids.

Methods: Permission to translate International Outcome Inventory for Hearing Aids was obtained from its developer. The questionnaire was translated back into Persian, and then the translated version was retranslated to English by qualified individuals to assess its correspondence with the original version. After this stage, the content validity of the questionnaire was checked by nine audiology experts, with the results analyzed by Lawshe statistical method. In order to examine the structural reliability, the questionnaire was completed by 15 hearing impaired people and the necessary corrections were made according to the results. Finally, the final form was answered by 90 hearing-aid users, with the Cronbach's alpha statistical method utilized to analyze the results. In order to assess the test-retest reliability, the questionnaire was recompleted again by 30 subjects 1-2 weeks later, with the paired t-test correlation employed to evaluate the results.

Results: The mean total score was 26.41 (SD=4.86). The test-retest results revealed no significant difference between the two groups. The internal consistency was 0.845 based on Cronbach's alpha, indicating acceptable test reliability.

Conclusion: The present study demonstrated that the Persian version of the International Outcome Inventory for Hearing Aids possesses a good validity and reliability.

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Introduction

Self-reports are simple, quick, and inexpensive tools for data collection, and are the best choice to quantify the patient's personality. Using Self-reports, researchers

can collect information about the real-world experiences of patients. This information cannot be observed directly or impossible to be simulated in laboratory [1].

The definition of satisfaction in the area of hearing aids involves reducing the impact of hearing loss on people's lives. Indeed, satisfaction assessment is a measure of the success or failure of all aspects of the fitting process and the selection of hearing aids [2]. Although there are numerous instruments for assessing

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the hearing aid outcomes, only the Glasgow Hearing Aid Benefit Profile (GHABP) [3] and International Outcome Inventory for Hearing Aids (IOI-HA) examine several dimensions, while the other top questionnaires only study one dimension. For instance, Abbreviate Profile for Hearing Aid Benefit (APHAB) only assesses the benefits [4]; and Satisfaction and Amplification in Daily Life (SADL) solely examines satisfaction [5]. Further, due to the difference in protocols and instruments, the investigation data and results cannot be normally shared across various studies [6]. The questionnaire results are also sensitive to various factors associated with the sociocultural environment, thus making the comparisons of the international results difficult [7]. Several studies have used IOI_HA questionnaire to assess patient's satisfaction [8, 9], which was developed in English by Cox et al. [10]. It is a standard, international, and simple questionnaire [2] and has been translated into 27 languages so far [2, 11-15]. Hence, it can be used to compare and combine the outcomes between different studies and clinical service models worldwide. The IOI_HA questionnaire examines various dimensions of patient's satisfaction in 7 items [16]. The following areas are covered: (1) daily use; (2) benefits; (3) residual activity limitations; (4) satisfaction; (5) residual participation restrictions; (6) impact on others; and (7) quality of life. These questions are easy to rate and each of them is provided with 5 answers. The worst outcome has a score of 1, whereas the best outcome has a score of 5. The analysis shows that the items in the questionnaire could be sorted by two factors [17-21]. The first factor includes items 1, 2, 4 and 7 while the second factor contains items 3, 5 and 6. On average, patients with more hearing loss and communicational problems use hearing aids more often [22]. These two factors measure the total benefits and resolving the residual problems, respectively [23].

In comparison with previously published research, the present study has been performed across a wider society [2, 24]. The tools used to measure the benefits and satisfaction of hearing aid users should be highly reliable. The purpose of this study was to provide the Persian translation of the IOI-HA questionnaire, which should be simple and have high degrees of reliability and validity so that it can be used in the process of aural rehabilitation.

Methods

This research consists of two separate parts. Initially, the Persian version of the IOI-HA questionnaire was prepared, and then field investigations were conducted to assess the reliability and validity of the Persian version. Thus, the permission was acquired from the authors of the International Outcome Inventory for Hearing Aids (IOI-HA) for translating the questionnaire. Afterwards, the translation was performed as follows. First, the original version of the International Outcome Inventory for Hearing Aids (Appendix 1) was translated into Persian by two Persian translators with knowledge

of audiology and the English language culture, with the following measures taken (Forward translation).

The emphasis was laid on conceptual translation rather than literal translation. Attempts were made to include the meaning of the original word or sentence and use the most appropriate word suiting the meaning. Also, it was tried to write simple, clear, and concise questions and avoid long sentences. The terms that were not understandable by ordinary people (including Persian idioms and technical terms) were avoided.

Then, the Persian translation of the questionnaire was retranslated into English by two other experts, who had not seen the original text and had mastery over Persian and English languages (Backward translation).

Next, the translation produced in the backward translation was compared to the original version and the differences between the two versions were detected and resolved (revision of the backward translation).

After translating the questionnaire, its face validity was assessed by giving the questionnaire to 15 hearing-impaired users with hearing aids, and the required corrections were made based on the results. To assess the content validity of the questionnaire, 9 audiologist experts read the questionnaire and rated the questions based on the "relevancy", "simplicity" and "clarity" answers; they all stated that the quality of the translation was perfect (Content Validity Index (CVI) value for all the items was %100). The Lawshe statistical method was employed to analyze the results. The final questionnaire (Appendix 2) was completed by 90 hearing-impaired volunteers who used hearing aids in audiology clinics. They were informed about the purpose of the study. Afterwards, the test-retest reliability was examined by having 30 participants complete the questionnaire one or two weeks later. The mean age of the subjects was 55.37 years (standard deviation=20.83 years), with 34.4% being female and 65.6% being male. The duration of the use of hearing aids varied between 3 months and 120 months.

To assess the normality of distribution of the variables, we used the Kolmogorov-Smirnov test, as well as skewness and kurtosis measures. The paired t-test was conducted to examine the test-retest results. The correlation between the items was analyzed using the Pearson correlation coefficient (PCC). The Cronbach's alpha coefficient was also utilized to assess the internal consistency of the items. The Cronbach's alpha coefficients higher than 0.70 were considered as acceptable. [25] If the corrected item-total correlation is below 0.3, the given item does not enjoy a good correlation with the total scale, and thus it must be excluded. In "Cronbach's Alpha if Item deleted", if the Cronbach's Alpha value exceeds 0.8 or 0.9 by removing an item, the correction or deletion of the item should be checked [26].

The distribution of data was normal. The mean scores and standard deviations were obtained for each individual question and all questions. The correlation between items and Corrected Item-Total Correlation were obtained through Pearson correlation coefficient. This information is important because it evaluates the validity of each item. The internal consistency of the tool

was evaluated by analyzing the total Cronbach's alpha and Cronbach's Alpha if Item Deleted. The correlation between the items was measured by Pearson correlation coefficient at a significant level of 5%. The test-retest results were obtained via paired t-test and at a significant level of 5%. The statistical analyses were performed in SPSS 24 at a less than 5% significance level.

Results

In this study, 51 and 39 subjects used bilateral and unilateral hearing aids, respectively. Further, 46 subjects used in-the-ear hearing aids (ITE), while 44 had behind-the-ear (BTE) hearing aids. The mean and standard deviations values for each of the seven items are presented in Table 1 along with the "corrected item-total correlation" and the "Cronbach's Alpha if Item Deleted" results (Analysis after the first application – test (n=90)). The total Cronbach's alpha coefficient of 0.845 was obtained in this research, suggesting a high level of internal consistency (n=90).

Table 2 reports the correlation between the items. As can be observed, there is a significant correlation between most items.

Table 3 presents the mean (standard deviation) scores and correlations between the test-retest results (n=30). The test-retest correlation between the variables ranged from moderate to highly strong. Also, there was no

statistically significant difference between the questions ($P > 0.05$).

Discussion

Nowadays, the IOI_HA questionnaire is used in many studies to measure the effectiveness of hearing aids [23]. The results of a recent investigation suggest that this questionnaire has benefits for aural rehabilitation [11]. The internal consistency and validity of the Persian version of the International Outcome Inventory for Hearing Aids (IOI-HA) were assessed in this research. The mean items score (n=90) for the Persian version varied from 3.44 to 4.43 (Table 1). However, the mean item score of the English and Dutch versions varied between 3.5 and 4.1 as well as 3.19 and 4.34, respectively [19]. The mean scores higher than 50% reflect the users' satisfaction with the hearing aids. The research results confirm this finding [18, 19, 27]. If the mean IOI_HA scores grow, the users' satisfaction will also increase. If the total score of 22 or above is obtained, then the satisfaction and benefit of the hearing aids is significant [2]. In the present study, the mean total score was 26.41 (SD=4.86) and for the Portuguese version it was 27.33, [11] Similarly, for the revised Danish version it was 28 [28], while for Brazilian version was 25.74 [13]. These results suggest that the users' satisfaction and benefit of the hearing aids in the present study have

Table 1. Means and standard deviations as well as Item-total statistics for the Persian international outcome inventory for hearing aids (n=90).

Item no.	Mean	Std. Deviation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	4.4333	0.80797	0.273	0.865
2	3.6556	1.06170	0.752	0.799
3	3.5444	0.99618	0.746	0.801
4	3.7000	1.02168	0.667	0.814
5	3.4444	1.07171	0.448	0.850
6	3.8889	0.97663	0.652	0.816
7	3.7444	0.77258	0.718	0.812
Total	26.4111	4.86421		0.845

Table 2: Inter-item correlations for the Persian international outcome inventory for hearing aids (n=90)

Item	Item						
	1	2	3	4	5	6	7
1	1	0.320**	0.276**	0.186*	0.048	0.161	0.305**
2		1	0.636**	0.732**	0.314**	0.504**	0.713**
3			1	0.582**	0.486**	0.571**	0.606**
4				1	0.277**	0.507**	0.585**
5					1	0.531**	0.342**
6						1	0.513**
7							1

$P < 0.05^*$, $P < 0.01^{**}$ Pearson's correlation

Table 3: Test-retest results for the Persian international outcome inventory for hearing aids (n=30).

Item	Mean (SD) score		Test-retest correlation	P
	Test	Retest		
1	4.33 (0.844)	4.33 (0.80230)	0.849	0.000
2	3.87 (0.97)	3.97 (0.93)	0.797	0.000
3	3.90 (0.84)	4.17 (0.83)	0.857	0.000
4	4.00 (0.94)	4.10 (0.96)	0.683	0.000
5	3.77 (0.90)	3.97 (0.85)	0.712	0.000
6	3.97 (1.07)	4.07 (1.05)	0.897	0.000
7	4.03 (0.72)	4.13 (0.82)	0.578	0.001

$P < 0.05^*$ Pearson's correlation

been high and significant. Although users' satisfaction in the current study is higher than the results in Brazil, it is lower compared to the Danish and Portuguese studies. In this study, the highest mean score belonged to item 1 (daily use) and item 6 (impact on others) whose scores were 4.33 and 3.97, respectively. The lowest score was related to item 5 (residual participation restrictions) with the score of 3.44. In the Portuguese version, the highest mean score was observed for items 1 and 4 (satisfaction) with the scores of 4.54 and 4.08, respectively. However, the lowest score belonged to item 3 (residual activity limitations) with a score of 3.19 [11]. In the revised Danish version, the highest mean score was found for item 1 and item 4, while the lowest score was seen for item 3 [28]. In this study, it can generally be concluded that daily use of hearing aids has been high and hearing loss had less impact on their relationships. However, they have probably suffered from residual participation restrictions. The high score of items 1 and 4 in several studies might have been due to the motivation of satisfied individuals to participate in these studies. In Table 1, the correlation between item 1 and the total correlation was minimum ($=0.273$), while the correlations between the other items were relatively strong. Also, in the Dutch version, item 1 showed the lowest correlation with the total correlation [28]. Concerning "Cronbach's Alpha if Item deleted", similar results were obtained. Specifically, the analysis of this item indicated that if item 1 is deleted, the Cronbach's alpha increases by 0.2 from 0.845 to 0.865. This result indicates that item 1 is not adequately consistent. The same results were obtained for item 1 in the German version as well as the revised Danish version; for item 5 in the English version and for item 6 in the Portuguese version [18, 28, 29]. Note that these minor differences have a minor effect on the overall outcome [28]. The internal consistency grows with an increase in Cronbach's alpha coefficient of the questionnaire [30]. The Cronbach's alpha coefficient calculated in this research was 0.845, reflecting a high degree of internal consistency. This value was higher than the Cronbach's alpha coefficient of the English translation ($=0.78$) and lower than that of the German translation ($=0.91$) [17, 18]. The correlations between the test-retest questions were completely significant, and the significance level varied between the score of 0.578 (item7) and the score of 0.897 (item 6). The highest correlation of items in the test-retest was found in the Portuguese version for item 2 [11] ($=0.956$). This study reflects the high and acceptable reliability of the items. Further, the test-retest results showed no significant difference between the two groups, revealing the reliability of the Persian IOI-HA version ($P>0.05$).

Conclusion

The main goal of this research was to present the Persian version of IOI-HA with high degrees of internal consistency and reliability. The research results indicated the acceptable reliability and internal consistency of the questionnaire, and thus it can be utilized in the process

of aural rehabilitation of the hearing-aid users similar to other studies.

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References

1. Paulhus DL, Vazire S. The self-report method. *Handbook of research methods in personality psychology*. 2007;1:224-39.
2. Serbetcioglu B, Mutlu B, Kirkim G, Uzunoglu S. Results of Factorial Validity and Reliability of the International Outcome Inventory for Hearing Aids in Turkish. *Journal of International Advanced Otolaryngology*. 2009;5(1).
3. Gatehouse S. Glasgow hearing aid benefit profile: derivation and validation of. *J Am Acad Audiol*. 1999;10(80):103.
4. Cox RM, Alexander GC. The abbreviated profile of hearing aid benefit. *Ear and hearing*. 1995;16(2):176-86.
5. Cox RM, Alexander GC. Measuring satisfaction with amplification in daily life: The SADL scale. *Ear and hearing*. 1999;20(4):306-20.
6. Cox R, Hyde M, Gatehouse S, Noble W, Dillon H, Bentler R, et al. Optimal outcome measures, research priorities, and international cooperation. *Ear and Hearing*. 2000;21(4):106S-15S.
7. Arlinger S. Can we establish internationally equivalent outcome measures in audiological rehabilitation? *Ear and hearing*. 2000;21(4):97S-9S.
8. Cox RM, Alexander GC. The International Outcome Inventory for Hearing Aids (IOI-HA): psychometric properties of the English version: El Inventario Internacional de Resultados para Auxiliares Auditivos (IOI-HA): propiedades psicometricas de la version en ingles. *International journal of audiology*. 2002;41(1):30-5.
9. Buriti AKL, Oliveira SHdS. Hearing aid adaptation in users assisted by the Unified Health System. *Revista da Sociedade Brasileira de Fonoaudiologia*. 2012;17(1):41-6.
10. Cox R, Hyde M, Gatehouse S, Noble W, Dillon H, Bentler R, et al. Optimal outcome measures, research priorities, and international cooperation. *Ear Hear*. 2000;21(4 Suppl):106S-15S.
11. Paiva SM, Simões JF, Paiva AMD, e Sousa FJC, Bébéar J-P. Translation of the international outcome inventory for hearing aids into Portuguese from Portugal. *BMJ open*. 2017;7(3):e013784.
12. Cox RM, Stephens D, Kramer SE. Translations of the International Outcome inventory for Hearing Aids (IOI-HA). *International journal of audiology*. 2002;41(1):3-26.
13. Barbosa MR, Medeiros DdS, Rossi-Barbosa LAR, Caldeira AP, editors. Self-reported outcomes after hearing aid fitting in Minas Gerais, Brazil. *CoDAS*; 2015: SciELO Brasil.
14. Chu H, Cho YS, Park SN, Byun JY, Shin JE, Han GC, et al. Standardization for a Korean Adaptation of the International Outcome Inventory for Hearing Aids: Study of Validity and Reliability. *Korean Journal of Otorhinolaryngology-Head and Neck Surgery*. 2012;55(1):20-5.
15. Arlinger S, Nordqvist P, Öberg M. International outcome inventory for hearing aids: Data from a large Swedish quality register database. *American journal of audiology*. 2017;26(3S):443-50.
16. Barr C, Quinn S, Williams C. Changes in self-reported outcomes with hearing aids over time. *Australian and New Zealand Journal of Audiology, The*. 2012;32(2):95.
17. Cox RM, Alexander GC. The International Outcome Inventory for Hearing Aids (IOI-HA): psychometric properties of the English version. *Int J Audiol*. 2002;41(1):30-5.
18. Heuermann H, Kinkel M, Tchorz J. Comparison of psychometric properties of the International Outcome Inventory for Hearing Aids (IOI-HA) in various studies Comparación de las propiedades psicométricas del Cuestionario Internacional de Resultados para Auxiliares Auditivos (IOI-HA) en varios estudios. *International journal of audiology*. 2009.
19. Kramer SE, Goverts ST, Dreschler WA, Boymans M, Festen JM. International Outcome Inventory for Hearing Aids (IOI-HA):

- results from the Netherlands: El Inventario Internacional de Resultados para Auxiliares Auditivos (IOI-HA): resultados en los Países Bajos. *International Journal of Audiology*. 2002;41(1):36-41.
20. Stephens D. The International Outcome Inventory for Hearing Aids (IOI-HA) and its relationship to the Client-oriented Scale of Improvement (COSI): El Inventario Internacional de Resultados para Auxiliares Auditivos (IOI-HA) y su relación con la Escala de Mejoría Orientada hacia el Cliente (COSI). *International journal of audiology*. 2002;41(1):42-7.
 21. Vestergaard MD. Self-report outcome in new hearing-aid users: Longitudinal trends and relationships between subjective measures of benefit and satisfaction: Resultado auto-reportado en nuevos usuarios de auxiliares auditivos: Tendencia longitudinal y relaciones entre mediciones subjetivas de beneficio y satisfacción. *International journal of audiology*. 2006;45(7):382-92.
 22. Meister H, Lausberg I, Kiessling J, von Wedel H, Walger M. Modeling relationships between various domains of hearing aid provision. *Audiology and Neurotology*. 2003;8(3):153-65.
 23. Dillon H. *Hearing aids*. Boomerang Press; 2012.
 24. Roshan MF, Fatahi J, Geshani A, Jalaie S. Development, validity and reliability of Persian international outcome inventory for hearing aids questionnaire. *Auditory and Vestibular Research*. 2017;26(4):240-6.
 25. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International journal of medical education*. 2011;2:53.
 26. Hair JF, Black WC, Babin BJ, Anderson RE, Tatham R. *Multivariate Data Analysis* (ed.): Pearson Prentice Hall. 2010.
 27. Prates LPCS, Iório MCM. Acclimatization: speech recognition in hearing aid users. *Pró-Fono Revista de Atualização Científica*. 2006;18(3):259-66.
 28. Thunberg Jespersen C, Bille M, Legarth JV. Psychometric properties of a revised Danish translation of the international outcome inventory for hearing aids (IOI-HA). *International journal of audiology*. 2014;53(5):302-8.
 29. Gasparin M, Menegotto IH, da Cunha CS. Psychometric properties of the international outcome inventory for hearing AIDS. *Brazilian journal of otorhinolaryngology*. 2010;76(1):85-90.
 30. Gliem JA, Gliem RR, editors. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales 2003: Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.