Research Article

Cross-Cultural Adaptation and Psychometric Evaluation of the Persian Version of Hearing Handicap Questionnaire for the Elderly

Faezeh Azadi[1], Farzaneh Fatahi[1*], Saeid Farahani[1], Shohreh Jalaie[2], Ahmad Reza Nazeri[3]

[1.] *Department of Audiology, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran*
[2.] *School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran*
[3.] *Department of Audiology, School of Rehabilitation, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

Use your device to scan and read the article online

Citation: Azadi F, Fatahi F, Farahani S, Jalaie S, Nazeri AR. Cross-Cultural Adaptation and Psychometric Evaluation of the Persian Version of Hearing Handicap Questionnaire for the Elderly. Aud Vestib Res. 2024;33(1):1-9.

https://doi.org/10.18502/avr.v33i1.14267

Highlights

- The Persian version of hearing handicap questionnaire is a valid and reliable tool
- The P-HHQ can distinguish between elderly with different degrees of hearing loss
- The P-HHQ is a suitable instrument to evaluate hearing handicap in clinical settings

Article info:
Received: 01 Mar 2023
Revised: 15 May 2023
Accepted: 03 Jun 2023

* **Corresponding Author:**
Department of Audiology, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.
jfatahi@tums.ac.ir

ABSTRACT

Background and Aim: Hearing handicap, as one of the common health problems among older people, affects life activities. The Hearing Handicap Questionnaire (HHQ) is one of the scales that provide criteria for social withdrawal, participation restriction, and emotional distress. The present study aims to translate the HHQ into Persian and determine its psychometric properties.

Methods: After translation into Persian, the content validity of the questionnaire was determined based on the Lawashe's method. Then, the Persian HHQ (P-HHQ) and the Persian Hearing Handicap Inventory for Elderly-Screening version (P-HHIE-S) were completed by 110 hearing-impaired seniors (49 females) over 60 years. The concurrent validity was determined by Spearman correlation test, and the discriminant validity was analyzed by Kruskal-Wallis test and independent t-test. The test-retest reliability was assessed in 47 subjects after two weeks by Spearman correlation test and paired t-test.

Results: The P-HHQ had high face validity. The mean total score of P-HHQ was 1.89±1.05. It had a significant positive correlation with the score of P-HHIE-S (r=0.87) and pure tone average of the better ear (r=0.72). There was a significant difference between three groups of elderly with different degrees of hearing impairment ($p<0.001$). Cronbach's α values were in the range of 0.94–0.97. There was a strong correlation between test and retest scores of P-HHQ (r=0.97) which indicates a high test-retest reliability.

Conclusion: The P-HHQ has acceptable validity and reliability and can be used as a suitable instrument to evaluate hearing handicap of the elderly in research studies and clinical settings.

Keywords: Elderly; handicap; hearing handicap questionnaire; presbycusis; self-report

Introduction

Hearing loss is one of the most common chronic diseases in the elderly. Its prevalence is reported to be 30–46% in different populations and 90% in the population over 80 years of age [1]. With demographic changes in the developed countries, hearing loss can become a more serious problem [2]. According to the International Classification of Impairments, Disabilities and Handicaps (ICIDH), there are three terms related to hearing loss including impairments (dysfunction measurable in the laboratory or clinic), disabilities (impaired abilities and communication in real world), and handicaps (non-auditory outcomes flow from any disabilities). According to the World Health Organization (WHO), the hearing handicap is related to non-auditory outcomes that affects various aspects of life [3]. It is worth mentioning that the WHO replaced the International Classification of Functioning, Disability and Health (ICF), indicating the extent of activity and participation limitation instead of disability and handicap, with the ICIDH in 2001 [4]. There is no one-to-one relationship between the audiogram and the perceived handicap among the elderly [5]. There is an increasing agreement that hearing handicap is a complex condition such that audiometry test is unable to quantify its status [6]. What is determined with clinical evaluation is hearing impairment; while other aspects of deafness (disability and handicap) are not covered by using current clinical approaches [7]. Handicapping hearing loss, as one of the prevalent health problems among the elderly, can lead to cognitive decline, depression, social isolation, and not participating in social activities [8, 9]. With improvement in public health conditions, there is an increase in the elderly population and presbycusis phenomenon; therefore, it requires more attention of health policymakers to the quality of life and health of this population [10]. The term "presbycusis" refers to slowly progressive, bilateral, and symmetrical hearing loss that is associated with age-related cochlear degeneration and is affected by genetic factors and environmental factors such as alcohol use, ototoxicity, noise, and diabetes [2, 11]. Since presbycusis is irreversible, it is necessary to assess the quality of life along with early diagnosis and rehabilitation [10].

In people over 60 years of age, low phonemic and word recognition ability occurs due to low sensitivity at high frequencies [12]. The problems that older people experience are much more than what can be expected on their audiograms [5]. For example, if there is a lot of noise in the background, they may not be able to perceive what others are talking about. This problem becomes more obvious in processing fast rate speech and high amount of received information, and when talking with several people at the same time [13]. Peripheral changes of auditory function, decreased cognitive performance, and changes in central-auditory processes have a role in aging-related declines of speech comprehension [13]. To restore communication abilities, the evaluation and recognition of communication dilemmas seem necessary, which can be achieved by using valid and reliable tools including physical (such as audiometers) and psychological (such as self-reports). Self-report tools can help evaluate people's real-life problems based on their own statements, and is an affordable and fast approach for detecting hearing handicap.

Self-report tools have been accepted as a suitable tool for evaluating the effectiveness of treatment measures. In fact, it is a gold standard for assessment of attitudes [14]. There are various questionnaires developed to assess hearing disability and handicap, including social hearing handicap index [15], Hearing Handicap Inventory for The Elderly (HHIE) and its Screening version (HHIE-S) [16, 17], hearing performance inventory [18], and Hearing Handicap Questionnaire (HHQ) [19].

The HHQ was first developed by Gatehouse and Noble [19] and provides criteria for social withdrawal, participation restriction, and emotional distress [14]. It measures two topics: social restriction and emotional distress [20]. Each item is independent of any special auditory condition or capability [19]. It has 12 items rated on a five-point Likert scale [14]. Higher scores indicate a greater hearing handicap [20]. According to Thammaia, Kannada's translated version of HHQ has acceptable psychometric properties [14]. English version of HHQ has a Cronbach's alpha of 0.95 and 0.93 for emotional and social subscales, respectively, and has successfully been used in patients with cochlear implantation [20]. The HHIE, developed by Ventry and Weinstein, is a self-report questionnaire that evaluates the emotional and social adaptation effects of hearing impairment in the elderly [16]. The screening version of HHIE was developed in 1983 with 10 three-choice items measuring emotional (n=5) and social (n=5) consequences [17].

Independence of items from special auditory parameters and being appropriate for adults at all age scales are some advantages of HHQ which HHIE and HHIE-S have deprived them [14]. Although both HHQ and HHIE-S cover the two areas of social restriction and emotional distress, the HHQ has two more items than the HHIE-S. Since the responses to its items are rated on a five-point Likert scale, HHQ provides the possibility of a more detailed examination of hearing handicap. Also, the items of HHQ are independent of any specific listening ability, and even the hearing-impaired people with no experience of certain listening conditions can answer its questions. Considering the potential advantages of HHQ and lack of a Persian version of HHQ, the present study aims to translate the HHQ into Persian, evaluate its psychometric properties among the Iranian elderly, compare its score with the Persian version of HHIE-S (P-HHIE-S) score, and find the relationship between hearing impairment and hearing handicap.

Methods

Participants

This cross-sectional study was conducted from spring up to fall summer and fall, 2022. Participants were 110 Persian-speaking older people over 60 years of age (49 females and 61 males) with Sensorineural Hearing Loss (SNHL) referred to the cultural centers for the elderly in Tehran, Iran. Informed consent was obtained from the participants before data collection. History recording and Otoscopy by Welch Allyn otoscope were first conducted. Pure tone audiometric air-conduction thresholds were calculated at the frequencies of 0.25, 0.5, 1, 2, 4 and 8 kHz by Midimate 622 audiometer (Madsen Co.) and supra-aural TDH39 headphone. The Pure Tone Average (PTA) at the frequencies of 0.5, 1, 2 and 4 kHz was also calculated. The degree of hearing impairment was determined according to the PTA of the better ear. A PTA≤25 dB HL indicates a normal hearing, and a PTA of 25–40, 40–60, and >60 dB HL led to classification as mild, moderate and marked hearing impairment, respectively [21]. The inclusion criteria were: clinical diagnosis of SNHL (PTA of the better ear>25 dB HL), age>60 years, no conductive hearing loss, no otologic and neurological diseases, no cognitive disorders such as dementia (based on the mini-mental state exam score), being a native Persian speaker, and having at least a primary school education (for completing the questionnaires).

Procedure

The study was conducted at following steps: translation, validity evaluation, data collection, and reliability evaluation. HHQ has 12 items and two subscales of social restrictions (five items) and emotional distress (seven items). The items are rated on a 5-point Likert scale from 1 to 5 (never, rarely, sometimes, often, and almost always), and higher scores indicates a greater handicap. The total score of social participation restriction and emotional distress subscales ranges 5–25 and 5–35, respectively. Therefore, the score of the whole questionnaire is between 12 (no handicap) and 60 (the highest level of handicap). After obtaining permission from developers of the original version (Gatehouse and Noble) [19], the HHQ was first translated to Persian by two expert translators based on the protocol of the International Quality of Life Association [22]. Then, the research team merged these translated versions to provide initial draft of Persian version of HHQ (P-HHQ). Subsequently, it was back translated into English and sent to the authors of the original version to receive their comments and confirmation. Afterwards, 10 Persian audiologists rated the quality of translations and cultural compatibility of the Persian draft on a 5-point Likert scale.

Face validity refers to the extent of which a test is viewed as a tool for evaluating the concept it purports to evaluate [23]. To determine the face validity, the items of questionnaire were re-evaluated by 10 Persian audiologists based on a 5-point Likert scale from 1=completely disagree to 5=completely agree. Finally, after considering the comments of audiologists on the initial draft, the final version of P-HHQ was prepared.

After obtaining permission from the authorities of the Tehran municipality and the cultural centers, the P-HHQ and P-HHIE-S were given to the participants. The necessary instructions were provided to them about how to answer the questions. HHIE-S has 10 items measuring emotional (n=5) and social (n=5) consequences [5]. The items are rated as 4=Yes, 2= Sometimes, and 0= No. Therefore, the scores ranged from zero (no handicap) to 40 (severe handicap). A total score>8 indicate the presence of hearing handicap [24]. Furthermore, a total score of at least 26 indicates a high possibility (84%) of hearing handicap with moderate to severe degrees [5]. The P-HHIE-S was validated by Heidari et al [5]. Since in the present study, we aimed

to evaluate the hearing handicap of the elderly without hearing aids, the participants with hearing aids were asked to answer the questions based on their performance after turning their hearing aids off. To avoid the order effect, two questionnaires were randomly presented to the individuals.

Statistical analysis

For content analysis, Content Validity Ratio (CVR) and Content Validity Index (CVI) were calculated based on Lawashe's method. Normality of data distribution was evaluated using the Kolmogorov-Smirnov test ($p<0.05$).

Based on its results, nonparametric tests were used. To determine the concurrent validity, correlation between the scores of P-HHQ and P-HHIE-S and between the P-HHQ score and PTA of the better ear were measured by Spearman correlation test. For determining the discriminant validity based on degree of hearing impairment (mild, moderate and marked) and gender, Kruskal-Wallis test and independent t-test (since the sample size was more than 30) were used, respectively. To evaluate the test-retest reliability, 47 older people with hearing impairment (30 mild, 15 moderate and 2 marked hearing impairment) were selected randomly to complete the questionnaire twice at an interval of two weeks. Then, Spearman correlation test and paired t-test (since the sample size was more than 30) was used. To examine the internal consistency, Cronbach's α was used. Data analysis was performed in SPSS v.17. The significant level was set at 0.05.

Results

Demographic characteristics of participants (age, sex, severity of hearing impairment, and use of hearing aid) along with the hearing threshold of better and worse ears are presented in Table 1. Their mean age was 70.14±6.12 years, ranged 60-86 years. Majority of them were male (55.45%) with SNHL in both ears. Twenty participants (18.18%) were using hearing aid. The mean PTA in the better and worse ears was 37.78±10.78 dB HL and 40.46±11.33 dB HL, respectively. The range of PTA in the better ear was from 26.25 to 80 dB HL.

For the P-HHQ, the CVI was obtained 0.98. The CVR was 0.8 for the item 7 and 1 for other items. Table 2 provides the total and subscales score of the P-HHQ and HHIE-S. As can be seen, the mean total score of the P-HHQ was 1.89 and the HHQ subscale of emotional distress had the highest score. For evaluation of concurrent validity, Spearman correlation test results showed a significant positive correlation between total scores of P-HHQ and P-HHIE-S ($r=0.87$; $p<0.001$). Also, the subscale scores of P-HHQ had a significant positive correlation with subscale scores of P-HHIE-S (Table 2). The Spearman correlation test was also used for examining the correlation between PTA of better ear

Table 1. Demographic details of study participants

N	110	
Age (Mean±SD)	70.14±6.12	
Gender	**N**	**%**
Male	61	55.45
Female	49	44.55
Severity of hearing impairment		
Mild	66	60
Moderate	35	31.82
Marked	9	8.18
Hearing aid use		
Yes	20	18.18
No	90	81.82
Pure tone average of 500, 1 k, 2 k and 4 kHz (Mean±SD; in dB HL)		
Better ear	37.78±10.78	
Worse ear	40.46±11.33	

Table 2. Mean and standard deviation of Persian hearing handicap questionnaire and Persian hearing handicap inventory for elderly-screening and correlation between these two questionnaire and also between Persian hearing handicap questionnaire and pure tone average of better ear measured by Spearman correlation test (n=110)

	Mean±SD		Correlations(p)	
Subscale	P-HHQ	PHHIE-S	P-HHQ and PHHIE-S	P-HHQ and PTA of better ear
Total score	1.89±1.05	1.10±1.00	0.87(<0.001)	0.72(<0.001)
Emotional subscale	1.97±1.11	0.93±1.13	0.87(<0.001)	0.70(<0.001)
Social subscale	1.79±1.04	1.23±0.97	0.80(<0.001)	0.71(<0.001)

P-HHQ; Persian hearing handicap questionnaire, P-HHIE-S; Persian hearing handicap inventory for elderly-screening, PTA; pure tone average

Table 3. The comparison of total and subscale scores of the Persian hearing handicap questionnaire between three groups based on severity of hearing impairment measured by Kruskal-Wallis test (n=110)

	Mean±SD			
Subscale	Mild	Moderate	Marked	p
Total score	1.34±0.51	2.37±0.90	4.10±0.64	<0.001
Emotional distress subscale	1.42±0.64	2.43±0.98	4.19±0.50	<0.001
Social restriction subscale	1.23±0.36	2.28±0.92	3.98±0.95	<0.001

Table 4. Internal consistency of the Persian hearing handicap questionnaire measured by Cronbach's α and inter item correlations of this questionnaire measured by Spearman correlation test (n=110)

		Correlation(p)	
Subscale	Cronbach's α	Total score	Emotional distress subscale
Total score	0.97	-	-
Emotional distress subscale	0.95	0.98(<0.001)	-
Social restriction subscale	0.94	0.94(<0.001)	0.86(<0.001)

and the P-HHQ score. Its results reported a significant positive correlation of PTA with total score (r=0.72; p<0.001), and subscale scores of P-HHQ (Table 2). These results suggest good concurrent validity.

For evaluating the discriminant validity, the mean total score and subscale score of P-HHQ were compared between three groups of elderly with different degrees of hearing impairment (mild, moderate, and marked) using Kruskal-Wallis test whose results are shown in Table 3. As can be seen, there was a significant difference between three groups, and all scores were significantly higher in the group with marked hearing-impaired (p<0.001). Also, the mean total score and subscale score of P-HHQ were compared between males and females using independent t-test whose results showed no significant difference between them (p>0.05).

Cronbach's α was used to evaluate internal consistency. The results are presented in Table 4. As can be seen, Cronbach's α values were high for the total score and two subscales of P-HHQ, which was in a range of 0.94–0.97. This indicates the good internal consistency of the questionnaire. The correlations between the scores of two subscales and between the score of each subscale and total score were calculated by using the Spearman correlation test. The results are presented in Table 4. Base on the results, there was a significant correlation between all the mentioned variables (p<0.001). Spearman correlation test for evaluation test-retest reliability showed a significant correlation between test-retest scores of P-HHQ (r=0.97; p<0.001) in terms of total score and subscale score. Since the sample size was more than 30, the test-retest reliability was also measured by paired t-test. There was no significant difference between the mean test and retest scores (p>0.05). The results of test-retest reliability are shown in Table 5.

Table 5. The test-retest reliability of the Persian hearing handicap questionnaire measured by Spearman correlation test and paired t-test (n=47)

	Second time	
Subscale	**r(p)**	**t(p)**
Total score	0.97(<0.001)	−1.99(0.070*)
Emotional distress subscale	0.97 (<0.001)	−1.49(0.144*)
Social restriction subscale	0.93 (<0.001)	−1.70(0.096*)

* No significant difference at the level of 0.05

Discussion

The purpose of the current study was to translate the HHQ into Persian and evaluate its psychometric properties for Iranian older people. Participants were 110 seniors with SNHL. The face validity and content were confirmed in terms of comprehensibility, fluency, and cultural adaptation by 10 experts. In the study conducted by Thammaiah et al. on the Kannada version of HHQ [14], the CVR and CVI indicators were not reported. Our findings showed a significant strong correlation between the total scores of P-HHQ and P-HHIE-S, between the scores of the social restrictions subscale of HHQ and social subscale of HHIE-S, and between the scores of emotional distress subscale of HHQ and emotional subscale of HHIE-S. This is consistent with the findings of Noble et al. They reported that the social restrictions and emotional distress subscales of the origin HHQ had scores similar to the score of the subscales of origin HHIE [20]. Thammaiah et al. showed a moderate positive correlation between the Kannada version of HHQ and two other self-report tools including the participation scale ($r=0.52$; $p<0.001$) and the assessment of quality of life-4D scale ($r=0.53$; $p<0.001$) [14].

Although there is no one-to-one relationship between the audiogram and the perceived handicap among the elderly, given that hearing threshold cannot describe the level of perceived hearing handicap alone [5], in the present study, PTA of the better ear at the frequencies of 0.5, 1, 2, and 4 kHz had a significant strong correlation with total score and subscale score of the P-HHQ, indicating that the Persian version has a good concurrent validity. Other studies such as Ventry and Weinstein [16], Chang et al. [6], Tomioka et al. [24], Weinstein et al. [25], de Paiva et al. [26], Purnami et al. [27] and Heidari et al. [5], using the HHIE or HHIE-S, also reported a significant and moderate relationship between hearing threshold and perceived hearing handicap. However, the relatively moderate degree of this correlation reported in the mentioned studies can suggest that many other factors such as marital status and self-report general health reported in Chang et al.'s study [6] affected the amount of perceived hearing handicap in the elderly, in addition to hearing impairment.

Regarding the discriminant validity, our findings showed that the P-HHQ had a good capability to discriminate between three groups of elderly with different degree of hearing impairment (mild, moderate, and marked), since the total score and subscale score of P-HHQ were significantly different among three groups. The lowest and highest scores were reported in the elderly with mild and marked hearing impairment, respectively. This suggests that with the increase of hearing impairment, the perceived hearing handicap increases which is in agreement with the results of Weinstein et al. [25] and de Paiva et al. [26]. Weinstein et al. demonstrated that the Arabic version of HHIE-S could distinguish between different severities of hearing loss [25]. In the study by de Paiva et al., there was a significant difference in total scores of HHIE and HHIE-S between the case (83 individuals with PTA≥40 dB HL) and control (177 individuals with PTA≤40 dB HL) groups [26]. In the present study, gender could not significantly affect the degree of perceived hearing handicap, which was expected. There was no significant difference in total score and subscale score of P-HHQ between females and males. In other studies, by Wiley et al. [28], Chang et al. [6], and Heidari et al. [5], the non-significant effect of gender on perceived hearing handicap was also reported.

Cronbach's alpha was used for assessing internal consistency. An acceptable Cronbach's alpha is in

the range from 0.7 to 0.95 [29]. In the present study, Cronbach's α values for the whole questionnaire and for its two subscales was high, indicating the good internal consistency of the questionnaire. This is in agreement with the results of Thammaiah et al. for the Kannada version of HHQ [14] and Noble et al. for the main version of HHQ [20] who reported the high internal consistency for the HHQ. Several studies on the HHIE and HHIE-S such as Ventry and Weinstein [16], Tomioka et al. [24], Weinstein et al. [25], Öberg [30], and de Paiva et al. [26] reported that these questionnaires have high internal consistency ($\alpha>0.7$). In the present study, the correlations between total score and subscale score and between the scores of two subscales were also evaluated. Results indicated a strong correlation between them, which is consistent with the results of Thammaiah et al. [14] and Gatehouse and Noble [19]. In Thammaiah et al.'s study, the correlation between the total scale and the scores of social restrictions ($r=0.96$; $p<0.001$) and emotional distress ($r=0.98$; $p<0.001$) was high [14]. Gatehouse and Noble also reported a one-factor structure for the original HHQ [19]. Inconsistent with our study and the two mentioned studies, Noble et al. reported a two-factor structure for the English HHQ [20]. The discrepancy can be due to difference in the degree of hearing impairment in the target groups of these studies. In Noble et al.'s study, cochlear implant users with severe to profound hearing impairment were evaluated, while in our study and the two mentioned studies, the hearing loss of participants was mild to severe. Regarding the test-retest reliability of the P-HHQ, our findings showed that the correlation between the two assessment times in terms of total score and subscale score was strong and there was no significant difference between the test and retest phases, which indicate a high test-retest reliability. This is consistent with the results of Thammaiah et al. They reported that intraclass correlation coefficients values for the total scales and subscale score of the Kannada HHQ was greater than 0.9 [14].

One of the limitations of the present study was that other age groups were not examined, while the HHQ is appropriate for all age groups. Also, the participants were not equally distributed in terms of the degree of hearing impairment, where the number of people with mild hearing impairment was higher. It is recommended that future studies use the P-HHQ to investigate hearing handicap in other age groups and to evaluate the effects of interventions such as prescription of hearing aids on the perceived hearing handicap before and after rehabilitation.

Conclusion

The Persian version of hearing handicap questionnaire has acceptable face validity, concurrent validity, discriminant validity, reliability and internal consistency and can distinguish between older people with different degrees of hearing impairment. Its score has a strong correlation with pure tone average and the score of Persian hearing handicap inventory for elderly-screening. The findings allow clinicians to consider the Persian version of hearing handicap questionnaire in assessing the social and emotional effects of hearing impairment and suggest that this questionnaire can be used for assessing hearing handicap in research and clinical settings along with audiological evaluations such as audiometry.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of Tehran University of Medical Sciences (Code: IR.TUMS.FNM.REC.1401.006).

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

FA: Study design, data collection, interpretation of the results, final analysis, and drafting the manuscript; FF: Study design, interpretation of the results, and drafting the manuscript supervising the manuscript; SF: Design advising in questionnaire and manuscript; SJ: Statistical analysis and final confirm the interpretation; ARN: Design advising in questionnaire.

Conflict of interest

There are no competing interests declared by the authors.

Acknowledgments

This study is extracted from the MSc. thesis of F. Azadi that submitted to Tehran University of Medical Sciences. The authors would like to thank William Noble, who is one of the authors of the hearing handicap questionnaire and also the Cultural and Art Organization of Tehran.

References

[1] Sindhusake D, Mitchell P, Smith W, Golding M, Newall P, Hartley D, et al. Validation of self-reported hearing loss. The Blue Mountains Hearing Study. Int J Epidemiol. 2001;30(6):1371-8. [DOI:10.1093/ije/30.6.1371]

[2] Ciorba A, Bianchini C, Pelucchi S, Pastore A. The impact of hearing loss on the quality of life of elderly adults. Clin Interv Aging. 2012;7:159-63. [DOI:10.2147/CIA.S26059]

[3] World Health Organization. International classification of impairments, disabilities, and handicaps: a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976. Geneva: World Health Organization; 1980. Available from: https://apps.who.int/iris/handle/10665/41003

[4] World Health Organization. International classification of functioning, disability and health: ICF. Geneva: World Health Organization; 2001. Available from: https://apps.who.int/iris/handle/10665/42407

[5] Heidari F, Adel Ghahraman M, Tavanai E, Jalaie S, Zamiri Abdollahi F. Self-assessed hearing handicap in the elderly: a pilot study on Iranian population. Aud Vestib Res. 2021;30(1):33-41. [DOI:10.18502/avr.v30i1.5309]

[6] Chang HP, Ho CY, Chou P. The factors associated with a self-perceived hearing handicap in elderly people with hearing impairment--results from a community-based study. Ear Hear. 2009;30(5):576-83. [DOI:10.1097/AUD.0b013e3181ac127a]

[7] Demeester K, Topsakal V, Hendrickx JJ, Fransen E, van Laer L, Van Camp G, et al. Hearing disability measured by the speech, spatial, and qualities of hearing scale in clinically normal-hearing and hearing-impaired middle-aged persons, and disability screening by means of a reduced SSQ (the SSQ5). Ear Hear. 2012;33(5):615-6. [DOI:10.1097/AUD.0b013e31824e0ba7]

[8] Gates GA, Murphy M, Rees TS, Fraher A. Screening for handicapping hearing loss in the elderly. J Fam Pract. 2003;52(1):56-62.

[9] Gates GA, Mills JH. Presbycusis. Lancet. 2005;366(9491):1111-20. [DOI:10.1016/S0140-6736(05)67423-5]

[10] Said EA. Health-related quality of life in elderly hearing aid users vs. non-users. Egypt J Ear Nose Throat Allied Sci. 2017;18(3):271-9. [DOI:10.1016/j.ejenta.2017.11.006]

[11] Veiga SM, Alexandre J, Esteves F. Living with hearing loss: psychosocial impact and the role of social support. J Otolaryngol ENT Res. 2015;2(5):00036. [DOI:10.15406/joentr.2015.02.00036]

[12] Degeest S, Keppler H, Corthals P. The Effect of Age on Listening Effort. J Speech Lang Hear Res. 2015;58(5):1592-600. [DOI:10.1044/2015_JSLHR-H-14-0288]

[13] Martin JS, Jerger JF. Some effects of aging on central auditory processing. J Rehabil Res Dev. 2005;42(4 Suppl 2):25-44. [DOI:10.1682/jrrd.2004.12.0164]

[14] Thammaiah S, Manchaiah V, Easwar V, Krishna R, McPherson B. Psychometric properties of the hearing handicap questionnaire: a Kannada (South-Indian) translation. Int J Audiol. 2017;56(3):194-201. [DOI:10.1080/14992027.2016.1247500]

[15] Ewertsen HW, Birk-Nielsen H. Social hearing handicap index. Social handicap in relation to hearing impairment. Audiology. 1973;12(3):180-7.

[16] Ventry IM, Weinstein BE. The hearing handicap inventory for the elderly: a new tool. Ear Hear. 1982;3(3):128-34. [DOI:10.1097/00003446-198205000-00006]

[17] Ventry IM, Weinstein BE. Identification of elderly people with hearing problems. ASHA. 1983;25(7):37-42.

[18] Giolas TG, Owens E, Lamb SH, Schubert ED. Hearing performance inventory. J Speech Hear Disord. 1979;44(2):169-95. [DOI:10.1044/jshd.4402.169]

[19] Gatehouse S, Noble W. The Speech, Spatial and Qualities of Hearing Scale (SSQ). Int J Audiol. 2004;43(2):85-99. [DOI:10.1080/14992020400050014]

[20] Noble W, Tyler R, Dunn C, Bhullar N. Hearing handicap ratings among different profiles of adult cochlear implant users. Ear Hear. 2008;29(1):112-20. [DOI:10.1097/AUD.0b013e31815d6da8]

[21] Cruickshanks KJ, Wiley TL, Tweed TS, Klein BE, Klein R, Mares-Perlman JA, et al. Prevalence of hearing loss in older adults in Beaver Dam, Wisconsin. The Epidemiology of Hearing Loss Study. Am J Epidemiol. 1998;148(9):879-86. [DOI:10.1093/oxfordjournals.aje.a009713]

[22] Aaronson NK, Acquadro C, Alonso J, Apolone G, Bucquet D, Bullinger M, et al. International Quality of Life Assessment (IQOLA) Project. Qual Life Res. 1992;1(5):349-51. [DOI:10.1007/BF00434949]

[23] Johnson E. Face Validity. In: Volkmar FR, editor. Encyclopedia of Autism Spectrum Disorders. New York, NY: Springer New York; 2013. p. 1226-7.

[24] Tomioka K, Ikeda H, Hanaie K, Morikawa M, Iwamoto J, Okamoto N, et al. The Hearing Handicap Inventory for Elderly-Screening (HHIE-S) versus a single question: reliability, validity, and relations with quality of life measures in the elderly community, Japan. Qual Life Res. 2013;22(5):1151-9. [DOI:10.1007/s11136-012-0235-2]

[25] Weinstein BE, Rasheedy D, Taha HM, Fatouh FN. Cross-cultural

adaptation of an Arabic version of the 10-item hearing handicap inventory. Int J Audiol. 2015;54(5):341-6. [DOI:10.3109/14992027.2014.996827]

[26] de Paiva SM, Simões J, Paiva A, Newman C, Castro E Sousa F, Bébéar JP. Validity and Reliability of the Hearing Handicap Inventory for Elderly: Version Adapted for Use on the Portuguese Population. J Am Acad Audiol. 2016;27(8):677-82. [DOI:10.3766/jaaa.15146]

[27] Purnami N, Mulyaningsih EF, Ahadiah TH, Utomo B, Smith A. Score of Hearing Handicap Inventory for the Elderly (HHIE) Compared to Whisper Test on Presbycusis. Indian J Otolaryngol Head Neck Surg. 2022;74(Suppl 1):311-5. [DOI:10.1007/s12070-020-01997-5]

[28] Wiley TL, Cruickshanks KJ, Nondahl DM, Tweed TS. Self-reported hearing handicap and audiometric measures in older adults. J Am Acad Audiol. 2000;11(2):67-75. [DOI:10.1055/s-0042-1748012]

[29] Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53-5. [DOI:10.5116/ijme.4dfb.8dfd]

[30] Öberg M. Validation of the Swedish Hearing Handicap Inventory for the Elderly (Screening Version) and Evaluation of Its Effect in Hearing Aid Rehabilitation. Trends Hear. 2016;20:2331216516639234. [DOI:10.1177/2331216516639234]