The Psychometric Properties Persian Version of the Hearing Handicap Inventory Screening Version (HHIE-S) Among Older Adults

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Research

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Abstract

Background: There is a great need for a valid hearing loss measurement tool in the Persian language to help identify hearing handicap and potential communicational difficulties among Persian speaking older adults. The present study was aimed to validate and adapt the original English version of Hearing Handicap Inventory for the Elderly (HHIE) into Persian language.

Methods: A cross-sectional study was designed and data was collected from August to November 2019 in Tabriz, Iran among the older adults aged 60 years and above whose hearing loss had been confirmed by audiometry. Self-reporting and face-to-face interviews were the data collection methods in this study. The statistical analysis was performed using SPSS 26.0 (SPSS and STATA 14).

Results: An exploratory factor analysis of data resulted in two factors, which included 9 of the 10 items and accounted for 87.00% of the variance. Cronbach's alpha coefficient (0.85) and the test–retest reliability score (0.73) indicated good internal consistency.

Conclusions: The results showed that HHIE-S is a valid and reliable tool for assessing hearing handicap among Persian speaking and Iranian older adults.

Background

Ageing is associated with various underlying physiological changes and increased risk of experiencing more than one chronic condition (1). One of the most common chronic diseases/ conditions of old age is "Hearing loss" (2). Hearing loss is the third most common chronic condition affecting older adults as well as their daily communications (3). However, these people are usually are not insight about their hearing loss condition and may be under-reported (4).

Hearing loss has numerous adverse impact on the psychological and social well-being of older adults (2) because it affects nearly on all aspects of daily life. Hearing loss interferes with solitary activities, such as listening to the television or radio. Additionally, difficulty in using the telephone may influence on older adults' communication who are living alone (5). Moreover, difficulty in recognition of the spoken words, needing to a repetition of words by others, and uncertainty about having understood correctly, often lead to withdrawal from social activities, such as diminished attendance at a social gathering such as theatres, cinemas, churches, lectures, etc. This difficulty in recognition of words leads to declined intellectual and social interaction (6). Therefore, hearing loss can lead to social isolation, depression, anxiety, poor quality of life, and even cognitive performance decline in the old ages (7).

To manage and prevent these negative consequences of hearing loss, clinicians should attempt to early diagnose of hearing impairment as an integral part of the comprehensive geriatric assessment. Currently, the gold- standard method for early clinical detection of hearing loss is audiogram, but less access to audiometry centers and costs of audiogram may restrict referring to the health centers (8).

Lutman (1991) and Ventry and Weinstein (1983) proposed that the hearing difficulties among the older adults can be measured by a self-report manner rather than audiometric data (9, 10). Self-report measures help identify hearing handicap and potential communicational difficulties and also have an essential place role in the efficiency of hearing impairment screening programs for older adults (11).

The self-administered hearing loss tools are widely used as a quick and inexpensive method to screen hearing loss in clinical settings (8). Several questionnaires for assessing of hearing disability have been developed and used in the English-speaking population such as the Hearing Disability and Handicap Scale (HDHS) (12), the Gothenburg Profile (GP) (13), the Hearing Handicap Questionnaire (HHQ) (14), Complete Intelligibility Spatiality Quality (CISQ) (15), the Speech Spatial and Qualities of Hearing Scale (SSQ) (16), and the Hearing Handicap Inventory for the Elderly (HHIE) (17). But among these tools, HHIE was more widely used in hearing loss assessment among older adults (18).

In 1982, Ventry and Weinstein has developed the 25-item HHIE to assess psychosocial handicap of hearing impairment in the elderly ages(17). It was incorporated for use in community-based studies among older adults, especially in inaccessible rural areas of developed countries (19, 20). A shorter widely used 10-item version of the HHIE-S was developed next in 1986 as a screening tool for handicapping hearing loss (21). This screening instrument is widely used and its reliability and validity have been well established in numerous studies (21, 22). This tool has been found to have high internal consistency reliability and high test-retest consistency for different languages (21, 23). Due to its reliability, validity, and brevity, the HHIE-S has also been found to be effective tool in measuring the performance of different types of hearing aid tools (24–26). In addition, it is available in many languages, including Spanish (19), Chinese(27), India (20), Portuguese(28), Swedish (29). Since there is a great need for a valid hearing loss measurement tool in the Persian language, the present study was aimed to validate and adapt the original English version of HHIE-S into Persian language and consequently using HHIE-S among older adults.

Materials And Methods

Participant

The study applied a cross-sectional design which was conducted from August to November 2019 in Tabriz, Iran. Through convenience sampling, a total of 210 older adults aged 60 + years were enrolled in the study. This sample size was arrived based on the recommendation of having at least 5 to 10 participants per the scale's items (30).

The inclusion criteria were people 60 years of age or older; who were able to understand and be able to speak the Persian language; and their hearing loss had been confirmed by audiometry. The exclusion criteria included inability to give informed consent and any cognitive impairment (as assessed by Abbreviated Mental Test). Self-reporting and face-to-face interviews were the data collection methods in this study. This research was approved by the Ethics Committee of the XXXX University of Medical Sciences (XXXX.REC.1397.327). Informed consent in writing was taken by all the study participants. All

the participants were ensured the confidentiality of their responses, identity, and the right to withdraw from the study at any stage.

Translation procedure

First, HHIE-S scale was translated from English to the Persian language according to the guidelines stated by the experts(31). Next, back-translation to the English language was performed by another bilingual translator. An advisory panel of academic and clinical experts, including an occupational therapist, a clinical psychologist, audiometers and a sociologist, collaborated to review the Persian version. A few minor amendments were made to some of the wordings to enhance readability. The consensus of all authors confirmed the final translation.

Measures

The HHIE-S comprises ten (10) items that were selected from the 25-item version of the HHIE (10). The HHIE includes two domains: (1) Emotional, (2) Social. Of the ten items, five items explore the emotional consequences (HHIE-E) while the remaining five items explore the social or situational effects (HHIE-S). There are three response options for each item, namely yes (score = 4), sometimes (score = 2), or no (score = 0). These scores are summed up, and higher scores indicate greater perceived activity limitation and participation restriction. The scoring is divided into three broad categories: 1) Scores of 0 to 10 represent little, or no activity limitations or participation restrictions; 2) scores of 12 to 24 indicate mild-moderate limitations and restrictions and 3) scores of 26 to 40 indicate significant limitations and restrictions (21). When implementing this tool to measure the effect of hearing aid rehabilitation, it has been recommended that the pre- and post-rehabilitation scores should vary by at least 10 points for the hearing aid intervention efforts to be considered effective (32).

Statistical analysis

The statistical analysis was performed using SPSS 26.0 (SPSS Inc., Chicago, IL, USA) and STATA 14 (Stata Corp, College Station, TX). The normality assumption of the data was examined by using skewness and kurtosis measures. The normality of distribution was checked by descriptive measures such as coefficients of skewness and kurtosis, mean and standard deviation (33).

Several statistical approaches were also used to assess the psychometric properties of the HHIE-S and were deployed in the following order.

Construct validity

The Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed to examine the construct validity of the HHIE-S. The EFA was conducted using Principal Axis Factoring (PCF) by varimax rotation. The Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were used to check the appropriateness of the study sample and the factor analysis model. The number of factors was confirmed based on eigenvalues and scree plot. Items with absolute loading values of 0.3 or greater

were regarded as appropriate (34). Bartlett's test of sphericity and KMO measure of sampling adequacy and total variance explained were used to assess model sufficiency (35). The KMO values higher than 0.7, significant values of Bartlett's test of sphericity (<0.05), and factor loadings ≥0.3 were considered for interpretation (36). Additionally, Confirmatory Factor Analysis (CFA) was conducted to assess how well the EFA extracted model fits the observed data. The weighted least squares estimation method was used with a weighted matrix of asymptomatic covariances. Fit indices and reasonable values of these indices were considered as $\chi 2$ / df < 5, Root Mean Square Error of Approximation (RMSEA) < 0.08, Tucker Lewis index (TLI) ≥ 0.90, Comparative Fit Index (CFI) > 0.90, and also Standardized Root Mean Square Residual (SRMSR) < 0.08 (37).

Reliability

Reliability of the tool was calculated by internal consistency and test-retest reliability. The internal consistency was measured by computing Cronbach's alpha coefficient. Moreover, "alpha if item deleted" for each item was calculated. To inspect test-retest reliability, a subgroup of the same medical students completed the questionnaire twice, separated by a 2-week interval, and Interclass Correlation Coefficient (ICC) was calculated. The satisfactory value of Cronbach's alpha and ICC was considered (≥0.70) (38).

Results

Sample characteristics

The older adults who participated in the study consisted of 112 (53.3%) men and 98 (46.7%) women. A majority of participants were 60–69 years old (54.3%), secondary education (34.3%), living with a spouse (37.1%). Other characteristics are shown in Table 1.

Table 1
Demographic characters of participants (n = 210)

Variables		n	Frequency%
Age (years)	60–69	114	54.3
	70–79	67	31.9
	> 80	29	13.8
Gender	Male	112	53.3
	Female	98	46.7
Education level	Illiterate	31	14.8
	Primary education	42	20
	Secondary education	72	34.3
	Diploma	45	21.4
	University	20	9.5
Living status	Living alone	16	7.6
	With spouse	78	37.1
	With children	45	21.4
	With spouse &children	69	32.9
	With other relatives/friends	2	1
Hearing aid user	Yes	163	77.6
	No	47	22.4
Having a history of chronic diseases	Cardiovascular	7	3.3
	Blood pressure	20	9.5
	Diabetes	18	8.6
	Others	11	5.2
Having dizziness	Yes	35	16.7
	No	175	83.3
Having permanent tinnitus	Yes	92	43.8
	No	118	56.2

Construct validity

EFA was performed on ten items through the principal axis factoring method. The KMO value was calculated as 0.87. Bartlett's test achieved a value of 856.83 at a significant level of less than 0.001, justifying the implementation of factor analysis on the sample based on the correlation matrix. The number of factors was confirmed using a scree plot of eigenvalues. The results demonstrated that the highest percentage of the total variance (57.50%) was explained by two factors which are summarized in Table 2.

Table 2
Factor Structure of the of the Hearing Handicap Inventory Screening Version (HHIE-S), n = 210

Items	F1*	F2**
HH4	0.73	
HH9	0.69	
HH1	0.62	
HH2	0.47	
HH7	0.38	
HH10		0.51
HH5		0.53
HH3		0.80
HH8		0.60
*F1: Emotional, **F2: Social		

CFA was conducted to test the fitness of the model obtained from EFA. As shown in Fig. 1, all goodness-of-fit indices (RMSEA = 0.07, TLI = 0.94, CFI = 0.96, and SRMSR = 0.04.) were satisfactory (Table 3).

Table 3
Confirmatory Factor Analysis Indices of the Hearing Handicap Inventory Screening Version (HHIE-S)

Measure	TLI*	SRMSR**	CFI***	RMSEA****
HHIE-S	0.94	0.04	0.96	0.07
*TLI, Tucker-Lewis Index; ** SRMSR, Standardized Root Mean Square Residual; *** CFI, Comparative Fit Index; ****RMSEA, Root Mean Square Error of Approximation				

Reliability

According to Table 4, Cronbach's alpha coefficient of the overall scale was 0.85, while the Cronbach's alpha coefficient of the subscales was 0.76 (F1: emotional) and 0.78 (F2: social). In the test-retest method, the ICC (95% Confidence Interval) of the total questionnaire was 0.73 (0.32 to 0.89).

Table 4
Summary of the Characteristics of the Factors

Factors (Subscales)	Number of items	Range	Mean (SD)	Kurtosis	Skewness	Cronbach α.
F1	5	0–20	8.82 (2.59)	-0.96	0.26	0.76
F2	4	0–16	5.50 (1.78)	0.58	1.18	0.78

Discussion

The study was aimed to examine psychometric properties of the HHIE-S among Iranian older adults. This study is the first to describe and examine the psychometric characteristics of the HHIE-S in Persian language and among the population of older adults in Iran. In translation and cultural adaptation of HHIE-S, we were not faced with serious problems. As such, it was not necessary to make major changes in the original version of HHIE-S, and its validity and reliability indices were satisfactory.

Our study indicated that although the HHIE-S was developed and known as a self-administered questionnaire, illiterate or people with a low level of literacy, were not able to complete the questionnaire by themselves. Hence, for these participants, we used a face to face interview to complete the questionnaire.

The study findings demonstrated that the HHIE-S adapted to the Persian language maintained its original reliability and validity. The test-retest reliability and Cronbach's α were acceptable for total scale, and subscales reflected sufficient internal consistency of the HHIE-S, consistent with the findings of other psychometric studies of the HHIE-S on other socio-cultural contexts (31, 39).

The validity and reliability of this questionnaire have been done in some countries but not in developing countries, so this is the first study in Iran.

The current results of exploratory factor analysis (EFA) suggested a two-factor structure as an optimized structure that this finding is consistent with other studies (26, 40). Besides, the results obtained from the confirmatory factor analysis (CFA) indicated that the two-factor model fits very well with the data.

Unlike the original scale of HHIE-S, item 6 did not load, this may be due to the cultural differences between the two study locations or contextual characteristics that existed within the studied populations.

Limitations Of This Study

The study had two limitations, first, HHIE-S is a self-administered questionnaire; therefore, results may be affected by response bias, and second, our study participants were not randomly selected because of limitation to reach participants.

Conclusion

The results showed that the Hearing Handicap Inventory for the Elderly-Screening (HHIE-S) is a valid and reliable tool for assessing hearing handicap among Persian speaking and Iranian older adults.

Abbreviations

HHIE-S: Hearing Handicap Inventory for the Elderly- Screening version

EFA: Exploratory Factor Analysis

CFA: Confirmatory Factor Analysis

KMO: Kaiser–Mayer–Olkin

RMSEA: Root Mean Square Error of Approximation

TLI: Tucker Lewis index

CFI: Comparative Fit Index

SRMSR: Standardized Root Mean Square Residual

Declarations

Ethical approval

Ethical approval for the study was provided by Ethics Committee in Tabriz University of Medical Sciences (Ethics Code: IR.TBZMED.REC. 1397.327). Informed consent form was obtained from all the participants before the study.

Consent for publication

Not applicable.

Availability of data and materials

Please contact the corresponding author for data requests.

Competing interests

The authors declare no conflict of interest.

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Author contributions

LB, FA, MAJ, HA designed the study. LB collected survey data. LB, HH, MAJ, HA analyzed and present statistical results. LB, HH, HA were major contributors in writing the manuscript. VKC edited the manuscript. All authors read and approved the final manuscript.

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Figures

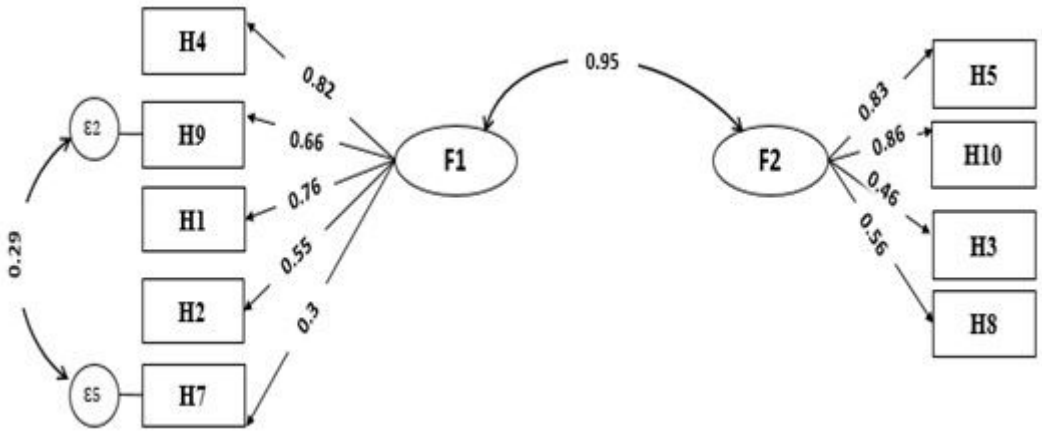

Figure 1

Confirmatory Factor Analysis of the Two-factor Model of the HHIE-s