

## Research Paper

## Persian Version of the Hyperacusis Questionnaire: The Translation Process, Psychometric Properties, and Diagnostic Criteria in Normal Hearing People

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**ABSTRACT**

**Objectives:** The current study was performed to determine the validity and reliability of the Persian version of the Khalfa Hyperacusis questionnaire (HQ) and its differential validity between normal people and patients with hyperacusis or tinnitus.

**Methods:** The international quality of life assessment (IQoLA) method was considered for the translation process. After determining face and content validities of the Persian version, 81 patients with hyperacusis and or tinnitus (22 participants with hyperacusis, 18 with hyperacusis and tinnitus and 41 with tinnitus) with a mean age of  $40 \pm 2.9$  years and 80 normal people with a mean age of  $36.9 \pm 1.31$  years were tested for reliability and differential validity for clinical use. The reliability of this questionnaire was tested through the test-retest method in all participants of both groups with an interval of two weeks.

**Results:** The content validity ratio and content validity index approved the face validity of the Persian version of the HQ. The average total score for patients in group 1 was 21.3, significantly higher than 3.75 for the normal group. A high total score Cronbach coefficient was found to be 0.90, which approved the internal consistency of the HQ. The cut-off point of the questionnaire was estimated to be 17.5 for the total HQ score in the Persian version. The Persian version of the HQ shows high reliability with an intraclass correlation coefficient of 0.97.

**Discussion:** The Persian version of the HQ showed high validity and reliability, which suggests its usefulness in hyperacusis clinics. A total HQ score of 17.5 or more is indicated as a cut-off point for classifying hyperacusis patients. Further studies on other populations are suggested for generalizing the results.

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## Highlights

- The Persian version of the Hyperacusis questionnaire (HQ) questionnaire has verifiable validity and reliability for use in the process of diagnosing and following up the rehabilitation of hyperacusis disorder.

## Plain Language Summary

Hearing problems do not always show themselves as hearing loss, and sometimes the problem in sound processing shows itself in the form of annoying and intolerable loudness, which is commonly called hyperacusis. In this disorder, sounds with a mild or moderate intensity level, which are tolerable for the general public, will be annoyingly loud and intolerable for patients with this disorder. This abnormal sound sensitivity creates many problems in daily life for sufferers and threatens their educational or occupational or social status depending on the patient's age. Apart from the various causes that make this problem, the most reliable tool to determine the existence and degree of this sound sensitivity disorder in each patient is the use of relevant questionnaires. Just like tinnitus, Hyperacusis questionnaires are also used in the process of diagnosis and rehabilitation of this type of disorders. The present study aims to present and determine the validity and reliability of the Persian version of one of the most widely used hyperacusis questionnaires (HQ questionnaire). With the availability of this questionnaire, people who show signs of sound intolerance can be identified more easily, and the improvement process can be followed by audiologists by periodically checking the changes in the score of this questionnaire.

## 1. Introduction

One of the hearing impairments among clients of hearing centers is the inability to tolerate many sounds, even with moderate intensity levels. The term that generally describes sound intolerance is called hyperacusis, which in many cases occurs without environmental hearing impairment in the structure of the auditory system. In a general definition, hyperacusis is described as inappropriate or exaggerated responses to sounds that are tolerable for normal individuals [1]. Studies have shown that its prevalence is 10% to 15% in the general population [2].

Hyperacusis is one of the lesser-known hearing disorders compared to well-known hearing and balance disorders like Ménière's disease, cholesteatoma, benign paroxysmal positional vertigo, presbycusis, and semicircular canal dehiscence [3]. Hyperacusis can occur due to various neurological and structural causes, such as head injury or psychological and functional causes like chronic fatigue syndrome [1].

Hyperacusis as a sign or disorder is introduced in the field of sound loudness, in which the intensity of the sounds, which most people can tolerate, is perceived as insufferable. Although hearing loss and peripheral hearing system problems are one of the most important causes of tinnitus and hyperacusis, the presence of these disorders can be seen despite the normal hearing thresh-

olds in routine hearing tests. As the rate of hearing loss increases along with the population aging, the incidence of sound processing problems like tinnitus and hyperacusis may show an incremental pattern. Different sound sensitivity disorders with decreased sound tolerance include hyperacusis, recruitment, phonophobia, and misophonia. They have similar symptoms but are differentiated by expert audiologists who work in this field of auditory disorders through case history and appropriate test battery. Hyperacusis sufferers do not necessarily have better hearing thresholds than their counterparts. In fact, for hyperacusis patients, the normal sounds are not just a little loud but are completely intolerable. Due to the serious problems and complications caused by hyperacusis, such as anxiety, depression, sleep disorders, and concentration disorders, careful evaluation is necessary to diagnose and provide treatment or rehabilitation in these patients [4].

One of the most common tools to evaluate the impact of functional and mental disorders of hearing, such as tinnitus and hyperacusis, on patients' daily life are standard self-assessment questionnaires that examine different emotional and social dimensions in patients. These types of questionnaires help to identify the degree of disturbance of the disorder and its psychosocial complications and also to monitor the effectiveness of treatment or rehabilitation strategies. Restriction of access to the Persian version of these questionnaires in the field of hyperacusis is one of the clinical and research problems in Iranian audiology centers.

Different questionnaires are currently used to subjectively assess the effects of hypersensitivity to sounds and hyperacusis. The number of questionnaires designed for this purpose is limited, and the most commonly used include the German questionnaire on hypersensitivity to sound, the multiple activity scale for hyperacusis, the inventory of hyperacusis symptoms, and hyperacusis questionnaire (HQ). Among these questionnaires, HQ designed by Khalfa, due to its high validity and ease of implementation, has been widely used in research and clinical application in different countries and different language versions [5-10]. HQ also evaluates the three areas of attentional, social, and emotional consequences in patients with hyperacusis.

Khalifa developed this questionnaire to assess several auditory aspects of hyperacusis. The questionnaire consists of two different parts. The first section includes three open-ended questions regarding general information about any history of hearing difficulties or disorders and any history of noise exposure. The second part includes 14 closed-ended questions that are considered in three main dimensions: attention (4 first items), social (6 next items), and emotional (4 last items). Each question/item is scored on a 4-point scale from “No” (0 points), “Yes a little” (1 point), “Yes (2 points), to” “Yes, a lot” (3 points). The hyperacusis questionnaire is one of the most approved and useful tools for hearing care professions to differentiate hyperacusis sufferers in the general population in different parts of the world with different ages, gender, etc. The questionnaire is useful in recognizing the clinical evaluation of hyperacusis and is also a reliable tool for following up with patients in different sessions or after receiving specific management or treatment methods [5].

The HQ was made in the English language by Khalfa, who is French-speaking. The questionnaire has been translated into Italian [6], Portuguese [7], Arabic [8], Japanese [9], and Turkish [10]. This study aimed to investigate the validity and reliability of the Persian version of the HQ and determine its potential as a simple but sensitive tool to evaluate hyperacusis and management.

## 2. Materials and Methods

HQ is divided into two parts. The first part has three open questions about the hearing disorders and noise exposure history of the client. The second part consists of 14 questions about the different dimensions and consequences of hyperacusis on the attention and social and emotional aspects of patients' life. Each question is answered and scored on a 4-point scale from “No”, “Yes,

a little”, “Yes”, to “Yes, a lot” (from 0 to 3 points, respectively). After obtaining permission from the creator of the questionnaire (Stephanie Khalfa), the process of translating the questionnaire was done according to the international quality of life assessment (IQoLA) protocol [11], so the translation was first done by two fluent translators in English and a specialist in Persian. Then, the translated version was back-translated into English by an experienced expert. The English version was presented to the author. After his approval, then the Persian translation was presented to 5 hyperacusis persons with secondary education level as the final target group of this questionnaire to read it aloud and give their opinions qualitatively and also to 10 audiologists in the field of tinnitus and hyperacusis to study it and express their views for face validity and then to approve its content validity. To analyze these results, the Lawshe method [12] was used to determine the content validity ratio, and the Waltz and Basel method [10] was used for the content validity index determination.

According to the method of determining the content validity ratio (CVR), each question of the questionnaire has three items: necessary (3 points), useful but not necessary (2 points), and not necessary (1 point), which was completed by 10 experienced audiologists. Experts also had three choices based on the Waltz and Basel method to determine the content validity index (CVI) for each item: relevance, clarity, and simplicity, which selected the appropriate option for each question in the questionnaire. Options for the item relevance included not-relevant, relatively relevant, and fully relevant. The experts chose the relevant option for each question. Options for being clear included not-clear, relatively clear, clear, and perfectly clear. The experts chose the desired option for each question. The options for being simple included not-simple, relatively simple, simple, and quite simple. The experts chose the option for each question based on the Likert scale. Then, based on the audiologists' comments, CVR and CVI values were calculated for each question. The acceptable value for CVR is more than 0.69, according to the number of audiologists participating in the survey. To evaluate the validity of the questionnaire, after making the necessary corrections, the questionnaire was presented to all selected samples based on the inclusion criteria. In this study, to test the reliability over time, the test-retest method was performed by calculating the intraclass correlation [14]. In this method, time reliability was evaluated by comparing HQ scores in two series with an interval of two weeks in all participants.

**Table 1.** Average content validity index of questionnaire

Item No. of HQ	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Average of CVI
Relevance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Clarity	0.9	1	1	1	1	0.9	0.8	0.9	1	0.8	1	1	1	1	0.95
Simplicity	0.9	1	1	1	1	0.9	0.9	1	1	1	0.9	1	1	1	0.97

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### Study participants

From October 2020 to August 2021, the prepared version of Persian HQ was introduced to 81 hyperacusis or tinnitus subjects (39 males and 53 females, age range 18-70 years with a Mean±SD of 40±2.9 years). Complaints of tinnitus for at least 6 months were checked in all test group subjects, and this special period was considered a usual criterion for a chronic state of tinnitus or hyperacusis that excluded any participants with transient perception or acute form of tinnitus and or hyperacusis. To evaluate the differential validity of the questionnaire, 80 normal individuals matched the patient’s age group were chosen as the control group. The exclusion criteria included more than 10 dB air-bone gap or more than 25 dB HL hearing loss in 250-4000 Hz evaluated with audiological data. Any history of the psychiatric disease was also considered as the exclusion criterion. After filling informed consent, all subjects of this study underwent an audiometric test of the pure tones, which were examined at the frequencies of 0.25, 0.5, 1, 2, 3, 4, 6, and 8 kHz. Also, the loudness discomfort levels were evaluated in the frequencies of 250 to 4000 Hertz. Test-retest evaluations for reliability determination were done in all 161 participants of the current study in a two-week interval.

### Statistical analysis

To determine the content validity, CVI indices in Waltz and Basel method and CVR in the Lawshe method were used. After the normality of the data was checked through the skewness test, the interclass correlation coefficient (ICC) was used by the test-retest method to determine the reliability in all participants of both groups (161 participants) with a two-week interval. The Cronbach coefficient values of 0.70 or greater for the total score and its three subscales were considered acceptable, and 0.80 or greater were considered good. The results of the current study were compared to the results found by Khalfa et al. in 2002 [5]. the differential validity between the two groups of normal subjects and hyperacusis-tinnitus sufferers was evaluated by the Mann-Whitney test. The receiver operating characteristic (ROC) curve was used to determine the cut-off point. Statistical analyses of the current study were performed using SPSS software, version 26 with a 95% confidence level approved by the Ethics Committee with the ethical code of IR.USWR.REC.1398.166.

### 3. Results

According to 10 audiologists, all the translated questions of the HQ have an acceptable score in terms of content validity, and according to the decision for CVR

**Table 2.** Comparing mean PTA, HQ, and LDL levels in both sexes in the normal and patient groups

Group	Auditory Variables	Male	Female	P
Normal group	Hearing threshold (PTA)	11.3	9.8	0.34
Normal group	HQ score	3.14	4.8	0.10
Normal group	Loudness discomfort level (LDL)	110	109	0.10
Hyperacusis/Tinnitus group	Hearing threshold (PTA)	16.03	17.9	0.15
Hyperacusis/Tinnitus group	HQ score	20.3	16.7	0.12
Hyperacusis/Tinnitus group	Loudness discomfort level (LDL)	93.9	100.3	0.06

Pure tone average (PTA): The average of hearing threshold levels at 500, 1000, 2000 and 4000 Hz.

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**Table 3.** Comparing the mean scores of the three dimensions of the Hyperacusis questionnaire between the normal and patient groups

Dimensions of HQ	Hyperacusis/Tinnitus Group	Normal Group	P
Attentional dimension	4.7	1.3	<0.05
Social dimension	8.2	1.1	<0.05
Emotional dimension	5.6	1.4	<0.05

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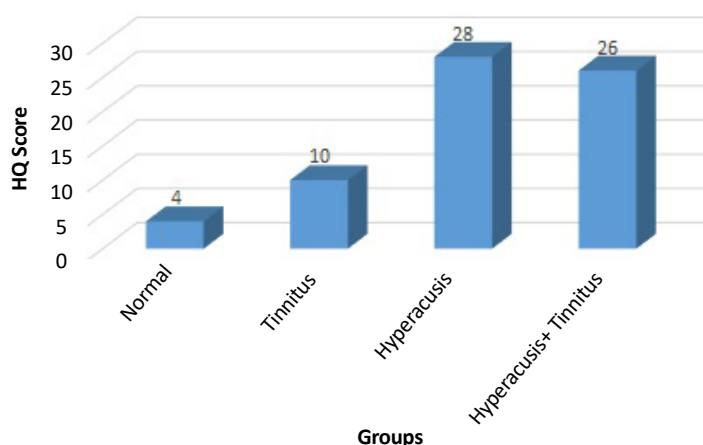
(between 0.8 to 1 for all 14 items of the questionnaire), the content validity value for the questionnaire was acceptable (above 0.69). The acceptable CVI value for each questionnaire item is more than 0.79. For each question to be accepted, its CVI value based on a survey obtained from experts must be more than 0.79 so that the question is included in the final text of the questionnaire. According to 10 audiologists, all the translated questions of the HQ have an acceptable score in terms of content validity, and according to the CVR decision-making reviews, the content validity value for the questionnaire was acceptable. Experts also had four choices about relevance, clarity, and simplicity of each item, based on the Waltz and Basel method to determine the content validity index. They selected the appropriate option for each question in the questionnaire. Options for the relevance item included not-relevant, relatively relevant, and fully relevant. The experts chose the relevant option for each question. Options for being clear included not-clear, relatively clear, clear, and perfectly clear. The experts chose the desired option for each question. The options for being simple include not-simple, relatively simple, simple, and quite simple. The experts chose the option for each question based on the Likert scale. Then, based on audiologists, CVR and CVI values were calculated for each question. The acceptable value for CVR is more than 0.69 according to the number of audiologists participat-

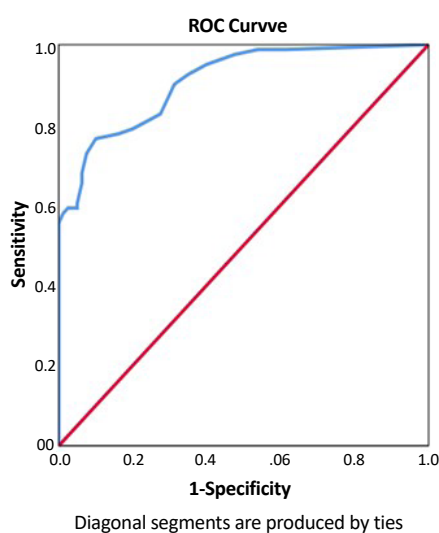
ing in the survey to evaluate the validity of the questionnaire. The acceptable CVI value for each question of the questionnaire is more than 0.79. For each question to be accepted, its CVI value based on a survey obtained from experts must be more than 0.79 so that the question is included in the final text of the questionnaire. According to 10 audiologists, all translated questions of the HQ questionnaire have an acceptable score in terms of content validity, and according to the CVR decision-making reviews, the content validity value for the questionnaire is acceptable.

The content validity index score for the items of relevance, clarity, and simplicity averaged 1, 0.95, 0.97, respectively, which is higher than the criterion of 0.79 and indicates the appropriate content validity index for the Persian HQ. Therefore, it seems that the text used in the questionnaire is principled and follows international standards in such a way that the method used in writing the questionnaire, as well as its clarity and relevance to the original version, is well observed (Table 1).

### Differential validity of the questionnaire

The Mann-Whitney test was used to evaluate the differential validity of this study. Thus, the mean total score of the normal group questionnaire was compared with

**Figure 1.** Comparing the total Hyperacusis questionnaire score between all participant's sub-groups Iranian Rehabilitation Journal



**Figure 2.** The receiver operating characteristic curve for cut-off point determining with highest sensitivity and specificity

the mean total scores of the patient group questionnaire, and a  $P < 0.05$  was obtained. There was no significant difference in HQ, PTA, and loudness discomfort level (LDL) scores between the two sexes (male and female) in any of the study groups (Table 2).

In all three dimensions of the questionnaire, a significant difference between two groups of normal people and patients was found (in all three dimensions, a significance level of less than 0.05 was obtained). In all three dimensions, the group of patients with tinnitus and or hyperacusis had a higher HQ score compared to the normal group (Table 3). A comparison of questionnaire scores in all study sub-groups is shown in Figure 1.

Also, based on the ROC curve, we found a cut-off point of 17.5 for the questionnaire (Figure 2). This finding is inconsistent with studies of Sandra Bastos et al. in the Portuguese version [7] and Naoki Oishi et al. in the Japanese version [9].

#### Reliability of the questionnaire

In this study, to test the reliability over time, both test-retest methods were assessed by calculating the ICC correlation. In this method, time reliability was evaluated by comparing HQ scores in two series with an interval of two weeks. For this study, the ICC coefficient was obtained two weeks apart for a total score of 0.83, and they were significantly correlated with each other. The internal consistency of the questionnaire was examined through the Cronbach  $\alpha$  coefficient [11]. The Cronbach  $\alpha$  coefficient was found to be 0.9 for the total score and subsets; the highest value of 0.9 was obtained for the social dimension and 0.83 for the emotional and attentional dimensions.

#### 4. Discussion

Audiologists and end-users approved different parts of the Persian version of the HQ. This confirmation indicates that the translation process of the HQ from English into Persian has been done with acceptable quality through the IQOLA method. Finally, all parts of the HQ have high quality in terms of eloquence. Intra-category reliability of the HQ Persian questionnaire with ICC score is the whole. This value indicates the optimal reliability of the questionnaire. The internal consistency calculated with Cronbach  $\alpha$  coefficient for the overall score of the HQ was 0.8, which indicates a high correlation between the questions of the HQ Persian questionnaire. The words of this questionnaire were created based on which it can be stated that it has a suitable apparent validity.

This study successfully provided a validated Persian version of the most well-known hyperacusis questionnaire and suggested that the considered point of 28 scores as a cut-off point is too high and may underestimate many clients with hyperacusis signs. In our study, we found a cut-off point of 17.5 versus the previous point, which the creators of the original version of this questionnaire suggested. That value representing very high sensitivity to sound is considered a high cut-off point by researchers of the hyperacusis field. This finding is consistent with the Japanese [9] and Portuguese [7, 15] versions. The difference in cut-off point, to some extent, could be the result of the considered selection and inclusion parameters of the samples in these studies. In the Khalifa study, no specific entrance criteria were reported for subjects of the general population [5], but in our survey, like the Portuguese, Japanese, and Italian versions of HQ research, only cases with tinnitus and or hyperacusis complaints participated.

The Persian version of HQ shows high internal consistency reliability for the total (Cronbach  $\alpha=0.9$ ) and the three dimensions of the HQ. Regarding the attention dimension, we found a Cronbach  $\alpha$  of 0.85; in the social dimension part of the questionnaire, we found Cronbach  $\alpha=0.90$ , and in the emotional dimension, 0.85 were found as Cronbach value. The reported high specificity of the HQ is important for correctly detecting the absence of the patient.

This version of the HQ was prepared for clinical use in the Persian language in accordance with the proper principles. Its validity and reliability, including content validity, apparent or face validity, test-retest reliability, and internal consistency, were evaluated in the current study.

## 5. Conclusion

The results showed that the Persian version of the HQ is a valid and reliable tool and can be used as a non-invasive clinical and research tool to differentiate patients with hyperacusis through the test battery approach within the specific criteria of the current study. Also, it suggests that the hyperacusis questionnaire score can use as a reference for monitoring the rehabilitation and management programs for hyperacusis in a different population of patients with different age ranges in the subsequent studies. The present questionnaire can evaluate three different dimensions of hyperacusis (emotional, social, and attention), so the rehabilitation program can be directed to the same area according to the points received in each area.

## Ethical Considerations

### Compliance with ethical guidelines

In this study, ethical guidelines have been considered and applied by the research team.

The Ethics Committee of the [University of Social Welfare and Rehabilitation Science](#) approved this study (Code: IR.USWR.REC.1398.166).

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The study was extracted from the MSc. thesis at the Department of Audiology, the [University of Social Welfare and Rehabilitation Sciences](#).

### Authors' contributions

Conceptualization, designing, writing, and editing: Mohanna Javanbakht; Data collection and writing the

original draft: Poria Seddigh-Hamidi; Methodology and writing: Mohsen Vahedi.

### Conflict of interest

The authors declared no conflict of interest.

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