

ORIGINAL ARTICLE

Turkish adaptation and validation of the Hyperacusis Handicap Questionnaire in tinnitus patients

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ABSTRACT

Objectives: This study aimed to evaluate the validity and reliability of the Turkish version of the Hyperacusis Handicap Questionnaire (HHQ) in individuals with tinnitus and to provide a culturally adapted instrument for clinical and research use.

Patients and Methods: This cross-sectional methodological study included 185 participants between January 2024 and January 2025. The original HHQ was translated and culturally adapted into Turkish following standardized forward-backward translation and expert panel procedures. Participants completed the Turkish version (HHQ-TR) along with the Tinnitus Handicap Inventory (THI). Internal consistency was assessed using Cronbach's alpha, and construct validity was examined through confirmatory factor analysis.

Results: A total of 185 participants (71 males, 114 females; mean age: 48.33 ± 12.94 years; range, 18 to 65 years) with subjective tinnitus for at least six months were recruited from an audiology clinic. The HHQ-TR demonstrated high internal consistency, with a Cronbach's alpha of 0.92 for the total score and 0.77, 0.80, and 0.84 for the functional, social, and emotional subscales, respectively. Item-total correlations supported the homogeneity of the scale. Confirmatory factor analysis confirmed a three-factor structure, with factor loadings ranging from 0.44 to 0.72. Strong correlations between HHQ-TR and THI scores further supported construct validity.

Conclusion: The Turkish version of the HHQ is a valid and reliable tool for assessing the functional, social, and emotional impacts of hyperacusis in individuals with tinnitus. Its use in clinical and research settings may facilitate more accurate evaluation of tinnitus-hyperacusis comorbidity, support treatment planning, and contribute to rehabilitation processes. Future studies should investigate the applicability of the HHQ-TR in diverse clinical populations and its sensitivity in monitoring treatment outcomes.

Keywords: Hyperacusis, reliability, tinnitus, Turkish adaptation, validity.

Tinnitus is defined as a “phantom auditory perception” characterized by the perception of sound in the absence of any external acoustic or mechanical stimulus.^[1] As one of the most common and distressing otological complaints,

tinnitus can significantly reduce quality of life, leading to various somatic and psychological problems such as sleep disturbances, concentration difficulties, anxiety, and depression.^[2,3] Hyperacusis, on the other hand, is a

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condition of auditory hypersensitivity characterized by the perception of sounds tolerable to normal-hearing individuals as disturbing or even painful.^[4] These individuals may experience commonly encountered environmental sounds as exaggeratedly intense and uncomfortable. In the literature, the prevalence of hyperacusis in the general population ranges between 8 and 15%, while in patients with tinnitus it may rise up to 30-60%.^[5,6]

Tinnitus and hyperacusis frequently co-occur, and this coexistence reduces sensory tolerance and intensifies the impact of auditory discomfort.^[7] Therefore, the evaluation of functional limitations caused by hyperacusis in individuals diagnosed with tinnitus is of critical importance in clinical monitoring and treatment planning. However, since objective measurement methods for hyperacusis are limited, the use of self-report questionnaires is widely preferred in clinical practice.^[8] One of the instruments developed for this purpose is the Hyperacusis Handicap Questionnaire (HHQ).^[9] The HHQ is a reliable and valid self-report tool that evaluates the impact of hyperacusis on an individual's daily life, social interactions, and psychological status. Validity and reliability studies conducted in its original language demonstrated that the HHQ is an effective instrument for clinical use.^[10] However, a Turkish adaptation of the HHQ and its validity-reliability study has not yet been conducted.

The aim of this study was to translate and evaluate the validity and reliability of the Turkish version of the HHQ in individuals with tinnitus and to introduce it into clinical practice.

PATIENTS AND METHODS

This cross-sectional methodological study was conducted at the Unit of Audiology, Balance and Speech Disorders Diagnosis and Rehabilitation, İbni Sina Hospital, Faculty of Medicine, Ankara University, between January 2024 and January 2025. A written informed consent was obtained from each patient. The study protocol was approved by the Ankara University İbni Sina Hospital Ethics Committee (Date: January 18, 2023, Approval no: İ01-27-23). The study was conducted in accordance with the principles of the Declaration of Helsinki. Inclusion criteria were the presence of subjective tinnitus for at least six months, being 18 years or older, and literacy in Turkish. Individuals with a history of psychiatric disorders, severe neurological diseases, or profound hearing loss were excluded from the study.

Translation and adaptation

The HHQ used in this study was translated into Turkish with permission from the original authors. The adaptation process was conducted in accordance

with the standard guidelines^[11] recommended for cross-cultural validity and reliability studies:

- *Forward translation:* Two independent translators translated the scale from English into Turkish.
- *Expert panel review:* The translations were reviewed by a committee consisting of audiology and language experts to ensure content accuracy and cultural appropriateness.
- *Back translation:* Two different language experts translated the Turkish version back into English, and it was compared with the original version.
- *Pilot testing:* A preliminary test was administered to 15 tinnitus patients to assess the clarity of the items, and necessary linguistic adjustments were made.

Data collection

Participants completed a sociodemographic form along with the Turkish version of the HHQ (HHQ-TR). In addition, the Tinnitus Handicap Inventory (THI) was administered to evaluate tinnitus and hyperacusis-related symptoms.

Statistical analysis

Descriptive statistics were presented first in the data analysis phase. Quantitative data were expressed as mean, standard deviation (SD), median, minimum, and maximum values, and qualitative data as frequency (number) and (%). The suitability of the quantitative variables for normal distribution was evaluated by the Shapiro-Wilk test. According to the results of these tests, quantitative data did not show a normal distribution. In this case, the Mann-Whitney U test, which is a nonparametric test, was used for the comparison of scales and subscales according to sex. To assess reliability, Cronbach's alpha coefficients and average item-total correlation values were calculated.

Confirmatory factor analysis was performed to confirm subscales. In the confirmatory factor analysis, the most commonly used fit indices to determine the goodness of fit of the tested model include the chi-square goodness-of-fit test, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), incremental fit index (IFI), root mean square residuals (RMR or RMS), and root mean square error of approximation (RMSEA). The acceptable and excellent value ranges of these fit indices are given together with the fit index values obtained from the study.

All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0

Table 1. Descriptive statistics of questionnaires and the subscales

	Mean $\pm$ SD	Median	Min-Max
HHQ Total	34.26 $\pm$ 17.41	32.00	0.00-84.00
HHQ Functional	12.91 $\pm$ 6.2	12.0	0.0-28.0
HHQ Social	9.92 $\pm$ 6.3	10.0	0.0-28.0
HHQ Emotional	11.61 $\pm$ 6.8	10.0	0.0-28.0
THI Total	46.06 $\pm$ 24.91	42.0	2.0-100.0
THI Functional	18.47 $\pm$ 11.74	18.0	0.0-44.0
THI Emotional	16.89 $\pm$ 9.72	16.0	0.0-36.0
THI Catastrophic	10.59 $\pm$ 5.98	10.0	0.0-26.0

SD, standard deviation; HHQ, Hyperacusis Handicap Questionnaire; THI, tinnitus handicap inventory.

(IBM Corp., Armonk, NY, USA) and AMOS, Version 23.0 softwares (IBM Corp., Armonk, NY, USA). A p -value < 0.05 was considered statistically significant.

RESULTS

This study included a total of 185 individuals (71 males, 114 females; mean age: 48.33 $\pm$ 12.94 years; range, 18 to 65 years) who presented to the audiology clinic with complaints of tinnitus. Of the participants, 61.6% were female, and 38.4% were male. Demographic characteristics are shown in Table 1.

Descriptive statistics of the participants' questionnaire scores are presented in Table 2. The mean total HHQ score was (34.26 $\pm$ 17.41; min-max, 0-84). Examination of the subscales revealed mean scores of (12.91 $\pm$ 6.20) for the Functional subscale, (9.92 $\pm$ 6.30) for the Social subscale, and (11.61 $\pm$ 6.80) for the Emotional subscale.

Table 2. Demographic characteristics

	n	%	Mean $\pm$ SD	Range
Age (year)			48.33 $\pm$ 12.94	18-65
Sex				
Female	114	61.6		
Male	71	38.4		
THI level				
Grade 1	24	13.0		
Grade 2	42	22.7		
Grade 3	54	29.2		
Grade 4	34	18.4		
Grade 5	24	13.0		

SD, standard deviation.

The mean total THI score was (46.06 $\pm$ 24.91; min-max, 2-100). Regarding the THI subscales, the mean scores were (18.47 $\pm$ 11.74) for the Functional subscale, (16.89 $\pm$ 9.72) for the Emotional subscale, and (10.59 $\pm$ 5.98) for the Catastrophic subscale.

These findings indicate a marked impact on both functional and emotional domains among the participants, and particularly that the total THI scores reflect a clinically moderate level of tinnitus impact.

When the distribution according to THI severity levels was examined, 13.5% of the participants were classified as Grade 1 (very mild), 23.6% as Grade 2 (mild), 30.3% as Grade 3 (moderate), 19.1% as Grade 4 (severe), and 13.5% as Grade 5 (very severe). These results indicate that the majority of participants (62.9%) were affected by tinnitus at a moderate or higher severity level.

In the evaluation of the correlation analysis of the scales and subscales with each other, there is a statistically significant correlation. In some, the correlation coefficient is high, in others medium and low, as shown in Table 3.

Cronbach's alpha and average inter-item correlation values are shown in Table 4. While the Cronbach's alpha coefficient for the entire scale is 0.92, the Cronbach's alpha coefficients of the functional, social, and emotional subscales are 0.77, 0.80, and 0.84, respectively. Cronbach's alpha coefficients show the internal consistency value related to reliability. It was found to be of quite high value.

Further, the average item correlation for the total scale was found to be good, with 0.35. Also, the average item correlation for the three sub-scales was

Table 3. Spearman correlation coefficients between the questionnaires and their subscales

	HHQ Total	HHQ Functional	HHQ Social	HHQ Emotional	THI Total	THI Functional	THI Emotional	THI Catastrophic
HHQ Total	1	0.865**	0.899**	0.890**	0.577**	0.579**	0.567**	0.359**
HHQ Functional		1	0.690**	0.629**	0.508**	0.534**	0.498**	0.259**
HHQ Social			1	0.775**	0.534**	0.535**	0.515**	0.339**
HHQ Emotional				1	0.522**	0.496**	0.534**	0.369**
THI Total					1	0.929**	0.926**	0.796**
THI Functional						1	0.790**	0.606**
THI Emotional							1	0.696**
THI Catastrophic								1

HHQ, Hyperacusis Handicap Questionnaire; THI, tinnitus handicap inventory.

Table 4. Cronbach's alpha and average item correlation values for the HHQ and subscales

	Cronbach's alpha	Average item correlation
HHQ	0.92	0.35
Functional	0.77	0.32
Social	0.80	0.37
Emotional	0.84	0.42

HHQ, Hyperacusis Handicap Questionnaire.

Table 5. Comparison of scales with sex

	Mean $\pm$ SD	Median	Min-Max	Z	p
HHQ Total					
Female	37.35 $\pm$ 17.12	36.00	2.00-84.00	-3.238	0.001
Male	29.30 $\pm$ 16.83	24.00	0.00-70.00		
HHQ Functional					
Female	13.81 $\pm$ 6.26	14.00	0.00-28.00	-2.553	0.011
Male	11.46 $\pm$ 5.87	10.00	0.00-28.00		
HHQ Social					
Female	10.82 $\pm$ 6.19	10.00	0.00-28.00	-2.598	0.009
Male	8.48 $\pm$ 6.24	8.00	0.00-24.00		
HHQ Emotional					
Female	12.93 $\pm$ 6.57	12.00	0.00-28.00	-3.686	<0.001
Male	9.49 $\pm$ 6.67	8.00	0.00-28.00		
THI Total					
Female	49.39 $\pm$ 24.01	48.00	2.00-100.00	-2.712	0.007
Male	40.78 $\pm$ 25.57	38.00	4.00-100.00		
THI Functional					
Female	19.76 $\pm$ 11.37	20.00	0.00-44.00	-2.129	0.033
Male	16.43 $\pm$ 12.09	14.00	0.00-44.00		
THI Emotional					
Female	18.02 $\pm$ 9.64	16.00	0.00-36.00	-2.156	0.031
Male	15.10 $\pm$ 9.66	14.00	0.00-36.00		
THI Catastrophic					
Female	11.48 $\pm$ 5.92	12.00	0.00-26.00	-2.662	0.008
Male	9.19 $\pm$ 5.83	8.00	0.00-20.00		

SD, standard deviation; HHQ, Hyperacusis Handicap Questionnaire; THI, tinnitus handicap inventory.

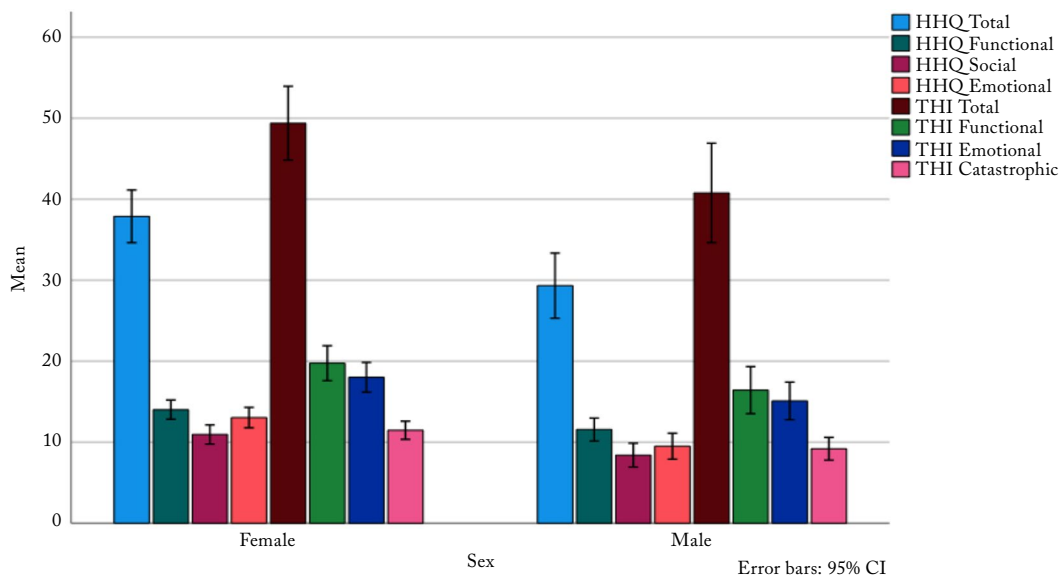


Figure 1. Comparison graph by sex.
CI, confidence interval.

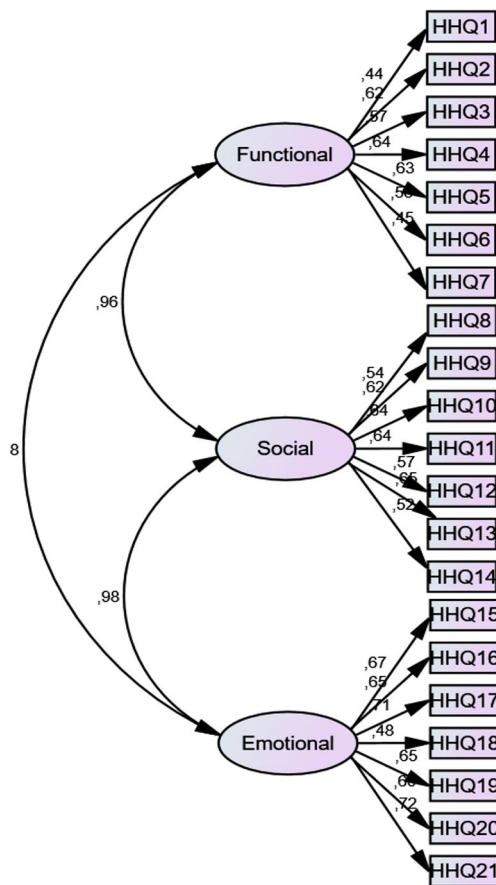


Figure 2. Path diagram of the three-factor structure of the Turkish version of the Hyperacusis Handicap Questionnaire (HHQ-TR) obtained through confirmatory factor analysis.
Chi-square = 314.221, $p < 0.001$, Chi-square/df = 1.726, RMSEA = 0.063.

found to be 0.32, 0.37, and 0.42 for functional, social, and emotional, respectively.

There was a statistically significant difference in the comparison of the scales and subscales according to sex, and the scores of women were higher than those of men, as shown in Table 5 and Figure 1 ($p < 0.05$).

The path diagram obtained after confirmatory factor analysis is given in Figure 2. The path diagram shows that the factor loadings of the items in the scale vary between 0.44 and 0.72.

The path diagram in Figure 2 shows the standardized scores of the three-factor scale, and all standardized values have to be smaller than 1.

Table 6 shows the results of confirmatory factor analysis, and the fit index values were examined. The following values were found: $\chi^2/df = 1.726$, RMSEA = 0.063, RMR = 0.074, CFI = 0.953, IFI = 0.958, GFI = 0.910, and AGFI = 0.860. These fit index values reveal that the model has a perfect to acceptable fit.

Consequently, according to the results of Cronbach's alpha coefficient and confirmatory factor analysis, the validity and reliability integrity of the scale is ensured.

According to the values given in [Supplementary Table 1](#), Item 2 has the highest average, and Item 14 has the lowest. Item-total correlation values range between 0.32 and 0.67, and Cronbach's alpha without the item values ranges between 0.72 and 0.83.

Table 6. The fit index values of the confirmatory factor analysis model

Indices	Perfect	Acceptable	Finding	Decision
	Goodness of Fit	Goodness of Fit		
χ^2/SD	0.0-2.5	2.5-3.0	1.726	Perfect
RMSEA	≤ 0.05	≤ 0.08	0.063	Acceptable
RMR	≤ 0.05	≤ 0.08	0.074	Acceptable
CFI	≥ 0.95	≥ 0.90	0.953	Perfect
IFI	≥ 0.95	≥ 0.90	0.958	Perfect
GFI	≥ 0.90	≥ 0.85	0.910	Perfect
AGFI	≥ 0.90	≥ 0.85	0.860	Acceptable

SD, standard deviation; RMSEA, Root Mean Square Error of Approximation, RMR, root mean square residual; CFI, comparative fit index; IFI, incremental fit index; GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index

DISCUSSION

This study aimed to evaluate the validity and reliability of the Turkish adaptation of the HHQ in individuals with tinnitus. The findings demonstrated that the scale exhibited high internal consistency for both the total score and the subscales; the overall Cronbach's alpha coefficient was 0.92, while the functional, social, and emotional subscales yielded values of 0.77, 0.80, and 0.84, respectively. The mean item correlations also supported the homogeneity of the scale, indicating that the items measured the same construct. These results are consistent with the high internal consistency reported in the original HHQ study and are in agreement with findings from cross-cultural adaptation studies conducted in different populations.^[9,12] The results suggest that the Turkish HHQ can be considered a reliable assessment tool for individuals with tinnitus and may provide valuable contributions in both clinical practice and research settings. In the original HHQ study conducted in 2020,^[9] the scale demonstrated high internal consistency across three subscales functional (0.83), social (0.81), and emotional (0.70) and sufficient test-retest reliability was reported. Similarly, in our study, Cronbach's alpha values (0.92) were found to be at an acceptable level, further supporting the reliability of the instrument. The validation of the Persian version of the hyperacusis questionnaire conducted by Kashani et al.^[13] in 2022 demonstrated high reliability values with a Cronbach's alpha coefficient of 0.84 and high test-retest reliability, revealing its cross-cultural validity potential. These results highlight that our study supports the outcomes of adaptation studies carried out in other cultural contexts.

In the Turkish validity and reliability study of the HQ conducted by Erincand Derinsu^[14] in 2020,

reliability values were found to be acceptable; however, some items were noted to show limited cultural compatibility. In contrast, the high Cronbach's alpha values obtained in our study suggest that the Turkish HHQ demonstrates stronger psychometric properties. In the revised Turkish Khalfa Hyperacusis Questionnaire (HQ-R) study conducted by Öztürk Özdeş et al.,^[15] it was reported that the revised version of the scale had a more consistent factor structure and improved reliability coefficients. These findings underscore the importance of revisions during linguistic and cultural adaptation processes. The values obtained in our study can also be considered to support this perspective. Fackrell et al.,^[6] in their study investigating the validity of the HQ in a tinnitus population, reported that the factor structure differed from the original and that the suitability of certain items could be questioned. Similarly, in our study, some differences were observed in the factor structure of the Turkish Hyperacusis Questionnaire within the tinnitus population, which are thought to be attributable to cultural adaptation. This finding indicates that hyperacusis assessment tools may be influenced not only by linguistic but also by cultural context.

On the other hand, the results confirm that the Turkish adaptation is both a reliable and valid measurement tool that can be applied to individuals with tinnitus. Considering that cultural adaptations may affect the psychometric properties of scales, our study provides a solid foundation for the assessment of hyperacusis in the tinnitus population and partially addresses the gap in the literature regarding cross-cultural validity.

A previous study reported that tinnitus and hyperacusis frequently co-occur and that their symptom severities are interrelated.^[16] Moreover, it

has been shown that approximately half of patients presenting to tinnitus clinics experience comorbid hyperacusis, which negatively impacts quality of life.^[17] These findings underscore the clinical significance of establishing the validity of the HHQ specifically in the tinnitus population.

In recent years, newly developed tools such as the Hyperacusis Assessment Questionnaire have aimed to evaluate hyperacusis in a more comprehensive and clinically sensitive manner.^[18] Nevertheless, the HHQ retains its value in clinical use due to its ability to assess the functional, social, and emotional impacts of hyperacusis through its subscales. Although the short version of the HQ^[19] has been reported to be more practical in clinical settings, the full HHQ provides greater advantages in terms of comprehensive assessment. Baguley and Hoare^[20] emphasized that one of the greatest research gaps in the field of hyperacusis lies in the standardization and cross-cultural validation of assessment tools. By demonstrating high reliability and validity of the Turkish HHQ, our study contributes to addressing this gap. The findings of our study show that the Turkish version of the HHQ can be used as a reliable assessment tool in individuals with tinnitus, providing valuable contributions in both clinical and research contexts. The use of the scale enables a more accurate and detailed evaluation of hyperacusis-tinnitus comorbidity, thereby directly contributing to treatment planning and rehabilitation processes. At the item level, Item 2 yielded the highest mean score, suggesting that difficulties related to concentration and task performance in noisy environments may represent one of the most prominent challenges experienced by individuals with tinnitus and hyperacusis. In contrast, Item 14 demonstrated the lowest mean score, indicating a relatively limited impact of sound intolerance on occupational decisions in the present sample. Future studies may investigate the usability of the HHQ across different age groups, various clinical populations, and in monitoring treatment efficacy.

This study has several limitations. First, the sample consisted solely of individuals with tinnitus; thus, the generalizability of the results to other clinical populations or the general adult population is limited. Second, the use of only self-report questionnaires during data collection may have introduced response bias and social desirability effects. Third, the sample size was limited, and studies with larger and more heterogeneous groups would strengthen the validity and reliability findings of the scale. In addition, test-retest reliability was not evaluated in the present

study. Therefore, the temporal stability of the HHQ-TR could not be determined. Future studies should assess test-retest reliability over different time intervals to further establish the stability of the instrument.

In conclusion, the sensitivity of the scale in clinical applications and its utility in measuring treatment response have not yet been investigated; therefore, future longitudinal and intervention-based studies are needed to more clearly establish the clinical effectiveness of the HHQ.

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