

Original article

Validity and reliability of the Central Kurdish version of the Tinnitus Handicap Questionnaire (THQ-CK)

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Abstract: Background — The goal of this study was to evaluate the reliability and validity of the Central Kurdish version of the Tinnitus Handicap Questionnaire (THQ-CK). Initially, the THQ was translated into the central Kurdish language, resulting in the THQ-CK. Subsequently, a supplementary assessment was conducted to ascertain the reliability and validity of the THQ-CK.

Methods — The original version of the THQ was translated into the Kurdish language and then offered to 275 tinnitus patients. The procedures were performed using published guidelines for cross-cultural adaptation of health-related quality of life measures. The Tinnitus Handicap Questionnaire (THQ), the Tinnitus Primary Function Questionnaire (TPFQ), and the Visual Analogue Scale (VAS) for tinnitus loudness and annoyance were offered to participants suffering from tinnitus. In addition, a pure-tone audiogram was obtained.

Results — Our study encompassed a total of 275 patients (132 female, 143 male). Their mean age was 47.43 ± 14.32 years. Of them, 43.6% previously worked in a noisy environment. The internal consistency of the THQ total score and its factors (Cronbach's alpha of total scores: 0.833; factors: 0.949, 0.959, 0.960) suggested excellent reliability. The test-retest correlation coefficient demonstrated excellent reliability (0.9) for the total scores, and factors 1 and 2, but moderate reliability (0.66) for factor 3. The THQ-CK demonstrated good construct validity, as indicated by the strong correlation ($r=0.757$) between the THQ-CK and TPFQ scores.

Conclusion — The evaluation of the validity and reliability of the THQ-CK suggests that it is a reliable instrument for assessing the impact of tinnitus on individuals in the central Kurdish-speaking population. The study contributes valuable information to the field of tinnitus research and opens up avenues for future cross-cultural studies.

Keywords: tinnitus, THQ, TPFQ, Central Kurdish language, cross-cultural adaptation.

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Introduction

Tinnitus is classified as a separate condition in the International Classification of Functioning, Disability, and Health (ICF 2001) with the code *b2400 Ringing in ears or tinnitus*. Classification of tinnitus helps in diagnosing the problem and facilitates the selection of the most appropriate treatment strategy [1]. Tinnitus is usually described as the subjective perception of sound in the ears or head in the absence of any external auditory stimulus. The prevalence of this condition is significant in the general population, but it shows marked variability between different studies. An estimated 15% of the general population suffers from tinnitus, and of these people, 20% experience significant distress and actively seek medical help [2]. Tinnitus can be divided into two main types: *objective tinnitus* caused by sound originating from within the body (e.g., muscle contraction in the middle ear or oropharynx, turbulence caused by vascular problems, or spontaneous otoacoustic emissions), and *subjective tinnitus* with no identifiable acoustic source. The former is less common than the latter [3].

The relationship between tinnitus and other health conditions such as hearing loss is significant, as they collectively contribute to

stress, social isolation, disability, and decreased quality of life. Tinnitus is a debilitating condition that significantly impacts a person's quality of life. The condition is characterized by symptoms such as irritability, depression, anxiety, frustration, insomnia, difficulty concentrating, and social isolation [4].

Subjective tinnitus is a condition that does not respond to treatment. The main goal of tinnitus treatment is to alleviate the impact of the condition. There are various methods for tinnitus treatment, such as counseling, sound therapy, and the use of hearing aids. Therefore, conducting a thorough assessment of the impact of tinnitus on patients is a critical component of tinnitus treatment. A tinnitus questionnaire is a commonly used approach to guide therapy and assess tinnitus [5]. Several questionnaires are used worldwide including: Tinnitus Handicap Inventory (THI) [6], Tinnitus Reaction Questionnaire (TRQ) [7], Tinnitus Primary Function Questionnaire (TPFQ) [8], and Tinnitus Handicap Questionnaire (THQ) [9].

THQ is a specialized questionnaire designed to assess the impact of tinnitus on major behavioral aspects of an individual's life. It is a comprehensive assessment instrument consisting of 27 items. Factor 1 assesses the impact of tinnitus on the individual's

physical, emotional, and social wellbeing. Factors 2 and 3 measure the extent to which tinnitus affects the patient's hearing ability and personal perception of tinnitus, respectively [10]. This questionnaire comprehensively measures the impact of tinnitus using a wide range of values from 0 to 100. This breadth of assessment covers even minor changes in treatment and assessment procedures, increasing its sensitivity [10]. Since translations of tinnitus questionnaires exist in different languages, it is essential to conduct a psychometric evaluation and compare the results across cultures. Such cross-cultural adaptations examine the impact of tinnitus on patients' quality of life taking into account their different backgrounds, including nationality, region, and culture [11]. We followed the cross-cultural adaptation and translation method of Beaton et al. to translate the THQ into Central Kurdish [12].

Kurdish is classified as an Indo-Iranian language within the larger Indo-European language family. The language is spoken by over 30 million people in Western Asia, primarily in Iraq, Turkey, Iran, Syria, Armenia, and Azerbaijan. Kurdish is a language system that includes numerous dialects and is characterized by a unique grammatical structure and rich vocabulary. Sorani, also known as Central Kurdish, is a widely spoken dialect of Kurdish [13].

We translated THQ into Sorani Kurdish, which resulted in the Central Kurdish version of the Tinnitus Handicap Questionnaire (THQ-CK). Hence, the goal of our study was to evaluate the reliability and validity of the THQ-CK. Subsequently, an additional evaluation was conducted to confirm the reliability and validity of the THQ-CK.

Material and Methods

Study design

This cross-sectional study encompassed a total of 275 participants from April 2022 through March 2023. The Research Ethics Board of Sulaymaniyah University provided ethical permission prior to the recruiting of prospective participants (No. 7/29-4758-1 approved on April 18, 2022). All participants were required to provide written informed consent before data collection commenced. The study was conducted in compliance with the Declaration of Helsinki after obtaining the written approval of the THQ author. The consent is available in [Supplement 1](#).

Cross-cultural adaptation of the THQ to its Central Kurdish version (THQ-CK)

THQ was subjected to a cross-cultural translation to create the Kurdish version following established questionnaire translation processes described by Hall et al. and Beaton et al. [12, 14]. To achieve this goal, we performed the following steps.

Initially, two native Kurdish speakers with multilingual skills independently translated the material into Kurdish. One translator had a medical background and the other was a professional translator. The second stage involved meeting with the two translators and the lead researcher to search for inconsistencies. An integrated Kurdish version was compiled as a result of these efforts. In the third stage, the THQ-CK was back-translated into English by two fluent Kurdish-English translators who were not familiar with the original English version of the THQ.

The fourth stage involved forming an expert committee in Sulaymaniyah/Iraq with our research team involving seven otolaryngologists, a methodologist, a Kurdish language specialist, and translators. They wanted to compare the original THQ with translated versions and the back translations. All translations were reviewed and inconsistencies were resolved by the committee. The goal of this stage was compiling the pre-final version of the THQ-CK. The questionnaire items were rated independently from 0 (poor translation) to 100 (perfect translation). If an item was rated below 80 by the expert committee, the translation was poor and a new translation was required. The translation of each item was agreed upon when its highest score was above eighty. [Supplement 2](#) contains the signatures of the experts. Pre-testing or piloting of the final THQ-CK constituted the fifth stage. In order to identify any linguistic and comprehensibility problems, the THQ-CK and a 5-point rating scale from 1 (very difficult to understand) to 5 (extremely easy to understand) were employed.

The Pilot study included 52 people, of which 26 had no experience of hearing loss or tinnitus and 26 people with tinnitus. The mean age of the participants was 47.43 years, the standard error was 1.007 years, and the standard deviation was 14.32 years. The sample consisted of 22 women and 30 men. Each participant read and completed their response to each THQ item in its entirety, rating each item based on their level of comprehension. The average range of ratings for all THQ items was 4.8, the standard error (SE) was 0.06, and the standard deviation (SD) was 0.40. Each participant assigned a rating of 4 (clear) or 5 (very clear) to all THQ items.

Table 1. Total score of THQ-CK and its factors in the 1st and 2nd assessments (paired-samples T test)

THQ-CK	Variables		Paired differences		P-value
	Mean	SD	Mean	SD	
Total score first assessment	34.9947	23.45520	-1.41689	2.64543	<0.001
Total score second assessment	36.4116	22.66637			
Factor 1: first assessment	17.1980	14.40141	0.43914	0.58159	<0.001
Factor 1: second assessment	16.7588	14.10741			
Factor 2: first assessment	9.1723	7.68075	0.23421	0.31018	<0.001
Factor 2: second assessment	8.9380	7.52395			
Factor 3: first assessment	8.6245	3.06709	-2.09024	2.39942	<0.001
Factor 3: second assessment	10.7147	3.01388			

Table 1 presents the mean and standard deviation of the total score of THQ-CK and its factors in the 1st and 2nd assessments, as well as paired differences between the 1st and 2nd assessments analyzed by paired-samples T test.

Table 2. Reliability of a total score of THQ-CK and its factors

Item	Mean	Standard deviation	Cronbach's alpha
Total score	34.9947	23.45520	0.833
Factor 1	17.1980	14.40141	0.949
Factor 2	9.1723	7.68075	0.959
Factor 3	8.6245	3.06709	0.960

The internal consistency of the TPFQ-CK was evaluated by calculating the Cronbach's alpha. The values of Cronbach's α coefficient for the total score of THQ-CK and all factors are presented in Table 2.

Table 3. Item-total correlation of THQ-Central Kurdish version

Item	Mean	Standard Deviation	Corrected item-total correlation	Cronbach's alpha if item is deleted
Q1	79.77	33.220	0.127	0.931
Q2	17.80	31.646	0.426	0.925
Q3	51.40	46.401	0.485	0.924
Q4	32.36	42.185	0.606	0.922
Q5	76.48	38.351	0.334	0.926
Q6	28.93	38.909	0.497	0.924
Q7	23.45	37.188	0.657	0.921
Q8	15.25	30.199	0.226	0.932
Q9	30.65	36.014	0.501	0.924
Q10	56.91	42.558	0.523	0.923
Q11	47.17	40.903	0.742	0.920
Q12	17.91	34.066	0.410	0.925
Q13	75.60	28.357	0.594	0.923
Q14	52.16	40.337	0.781	0.919
Q15	52.25	40.034	0.801	0.919
Q16	46.84	40.638	0.674	0.921
Q17	58.80	38.437	0.764	0.920
Q18	52.64	40.943	0.799	0.919
Q19	53.27	39.996	0.810	0.919
Q20	36.56	42.104	0.575	0.923
Q21	27.76	38.330	0.544	0.923
Q22	34.45	39.939	0.592	0.922
Q23	65.45	42.393	0.327	0.926
Q24	46.60	41.266	0.557	0.923
Q25	38.98	43.682	0.543	0.923
Q26	27.33	39.358	0.545	0.923
Q27	34.73	42.114	0.701	0.921

Table 3 shows item-total correlation for each item of the THQ-CK and Cronbach's alpha if item is deleted.

Table 4. Tests of normality

	Kolmogorov-Smirnov test			Shapiro-Wilk test		
	Statistic	df	P-value	Statistic	df	P-value
THQ-CK total score	0.093	275	0.000	0.939	275	0.000
Factor 1	0.116	275	0.000	0.925	275	0.000
Factor 2	0.116	275	0.000	0.925	275	0.000
Factor 3	0.133	275	0.000	0.967	275	0.000

In Table 4, the Kolmogorov-Smirnov and Shapiro-Wilk tests were employed to evaluate the distribution of the data. Both tests indicated that the data were not normally distributed.

Table 5. Spearman correlations between items in the 1st and 2nd assessments

		Factor 1: first assessment	Factor 2: first assessment	Factor 3: first assessment	THQ total score: second assessment
Factor 1: second assessment	Spearman correlation	0.999	0.999	0.368	0.985
Factor 2: second assessment	Spearman correlation	0.999	0.999	0.368	0.985
Factor 3: second assessment	Spearman correlation	0.295	0.295	0.666	0.390
THQ total score: second assessment	Spearman correlation	0.984	0.984	0.459	.992

To evaluate test-retest reliability, Spearman's rank correlation coefficients were used. We preferred this measure because our data were not normally distributed. The test-retest reliability of the TPFQ-CK shown in Table 5 is excellent.

The goal of this pilot study was to evaluate the clarity and adaptability of the questionnaire items. These individuals were excluded from the study. They confirmed that they could understand the questionnaire questions easily and shared their belief that the questionnaire contained important questions about tinnitus. The pilot study showed that the well-established transadapted THQ-CK required approximately 15–20 minutes to administer. During the sixth stage, the previous procedures were transcribed and the interviews conducted with the patients were evaluated to formulate the final version of the THQ-CK. The final version of the THQ-CK was developed after careful proofreading, which included spell check. The final version of the THQ-CK can be found in [Supplement 3](#). The THQ-CK was then offered to 275 individuals who experienced chronic tinnitus and met the specified criteria for participation. These individuals also provided written informed consent to participate in our study.

All participants in our study underwent a thorough check of their anamneses, physical examination, neurological assessment, ear examination, and a baseline audiogram test. They also completed the THQ-CK, a 27-item questionnaire that assesses the impact of tinnitus on physical, emotional, and social life. It also measures how tinnitus affects hearing and tinnitus perception. The TPFQ and the Visual Analogue Scale (VAS) for loudness and annoyance were administered. Scores ranged from 0 to 100. Participants were asked to choose a single number from 0 to 100, where 0 indicated complete disagreement and 100 indicated complete agreement. The examiner explained the questionnaire items to illiterate or poorly educated respondents. We administered the Central Kurdish version to a group of Kurdish tinnitus patients to test its reliability and validity. Detailed statistical studies confirmed its reliability and validity.

Participants

To determine the sample size, we used a minimum number of study subjects per variable of 10 [15, 16]. We concluded that a total of 275 subjects would be sufficient for our study. These 275 included patients reported experiencing subjective tinnitus for at least three months. They were recruited from a public medical center in Sulaymaniyah, Iraq, and from a private outpatient audiology clinic. The tinnitus sufferers were administered the central Kurdish version of THQ and the TPFQ. In addition, a pure-tone audiogram was obtained. Each participant completed the questionnaire (THQ-CK) within 15-20 minutes. The patients reported a clear understanding of the questionnaire items without any difficulty and expressed their opinion that the questionnaire covered important issues related to tinnitus. Researchers were present while study participants completed the questionnaires and helped them by answering any of their questions about items of the questionnaire.

Table 6. Factor analysis using principal component extraction

Item	Communality
Q1	0.700
Q2	0.735
Q3	0.547
Q4	0.695
Q5	0.434
Q6	0.663
Q7	0.538
Q8	0.517
Q9	0.433
Q10	0.481
Q11	0.719
Q12	0.417
Q13	0.672
Q14	0.745
Q15	0.832
Q16	0.610
Q17	0.760
Q18	0.816
Q19	0.795
Q20	0.721
Q21	0.731
Q22	0.819
Q23	0.441
Q24	0.429
Q25	0.379
Q26	0.433
Q27	0.603

Eigenvalue			
Factor	Eigenvalue	Variance percentage	Cumulative contribution of each factor, %
1	10.517	38.954	38.954
2	2.215	8.204	47.157
3	1.548	5.735	52.892

Table 6 presents the communalities of each item (question of a questionnaire), eigenvalue of factors, variance percentage, and cumulative contribution of each factor.

The inclusion criteria were: any patients whose age was between 18 and 80 years, experiencing subjective tinnitus for at least three months. The exclusion criteria were cognitive or linguistic impairments, objective tinnitus, and any identifiable medical cause of tinnitus.

Statistical data processing

The collected data were tabulated and analyzed using statistical methods on a personal computer with SPSS version 26 software. An evaluation was conducted to assess the cross-cultural adaptation of the THQ-CK questionnaire, focusing on its reliability and validity. The data were presented as mean (M) and standard deviation (SD) in numerical values and/or percentages. We calculated Cronbach's α coefficient to assess the internal consistency of the measurements [17]. Test-retest reliability was used to assess reliability, and we used the Spearman's correlation coefficient to assess test-retest reliability [18, 19].

Face validity was assessed by employing the THQ-CK and a 5-point rating scale from 1 (extremely difficult to understand) to 5 (very easy to understand) to identify potential language and comprehension difficulties. The construct validity of the THQ-CK was assessed using factor analysis (CFA) and the Spearman correlation test between the central Kurdish version of the THQ and TPFQ scores [20, 21].

Results

Patients

A sample of 275 patients, consisting of 132 females and 143 males, was included in the study. Their mean age was 47.43 ± 14.32 years, 56.4% of them resided in urban areas, 34.9% were employed, and 32.7% were housewives. As for their previous occupation, 43.6% of participants worked in noisy environment.

Summary of THQ-CK scores

The mean and SD of THQ-CK total score was 34.99 ± 23.45 in the first and 36.41 ± 22.66 in the second assessments (mean difference: -1.41 ± 2.64). The mean and SD of factor 1 was 17.19 ± 14.4 in the first and 16.75 ± 14.1 in the second assessments, and the mean and SD of factor 2 was 9.17 ± 7.68 and 8.93 ± 7.52 in the first and second assessments. The mean and SD of factor 3 was 8.62 ± 3.06 in the first and 10.71 ± 3.01 in the second assessments. The factors 1, 2 and 3 had a mean difference of 0.43 ± 0.58 , 0.23 ± 0.31 , and -2.09 ± 2.39 , respectively. The second assessment yielded small changes in all subscale values; these results were statistically significant (Table 1).

Reliability

Internal consistency. The internal consistency of the TPFQ-CK was evaluated by calculating the Cronbach's α coefficient. For the total score of THQ-CK, it was 0.833, which implied a high level of consistency. The Cronbach's α coefficients for factors 1, 2 and 3 were 0.949, 0.959, and 0.960, respectively (Table 2).

Table 7. Pattern matrix for factors 1, 2 and 3

Item (question)	Factor 1	Factor 2	Factor 3
Q19	0.847		
Q15	0.842		
Q18	0.831		
Q14	0.828		
Q17	0.794		
Q11	0.772		
Q16	0.764		
Q27	0.702		
Q4	0.626		
Q13	0.609		
Q23	0.599		
Q7	0.593		
Q24	0.576		
Q26	0.529		
Q25	0.518		
Q10	0.505		
Q2	0.502		
Q9	0.441		
Q22		0.872	
Q21		0.809	
Q20		0.799	
Q6		0.773	
Q12		0.539	
Q8			0.667
Q3			0.507
Q5			0.482
Q1			0.421

Extraction method: principal component analysis; rotation method: varimax with Kaiser normalization; an oblique rotation was performed on the factor loading matrix to simplify its format and explore the potential relationship between the three components. Table 7 displays the factor pattern matrix following oblique rotation.

Table 8. Correlations of the total score of the THQ-CK and its factors with other tests

		THQ total score	Factor 1	Factor 2	Factor 3
Spearman's rho	THQ-CK total score	Correlation coefficient	1.000	0.985**	0.985**
		P-value (2-tailed)	.	0.000	0.000
	Factor 1	Correlation coefficient	0.985**	1.000	1.000**
		P-value (2-tailed)	0.000	.	0.000
	Factor 2	Correlation coefficient	0.985**	1.000**	1.000
		P-value (2-tailed)	0.000	.	0.000
	Factor 3	Correlation coefficient	0.497**	0.367**	0.367**
		P-value (2-tailed)	0.000	0.000	0.000
	TPFQ-CK total score	Correlation coefficient	0.757**	0.719**	0.719**
		P-value (2-tailed)	0.000	0.000	0.000
	Bilateral PTA	Correlation coefficient	0.149*	0.147*	0.147*
		P-value (2-tailed)	0.013	0.015	0.015
	Level of tinnitus annoyance	Correlation coefficient	0.497**	0.438**	0.438**
		P-value (2-tailed)	0.000	0.000	0.000
	Level of tinnitus loudness	Correlation coefficient	0.451**	0.398**	0.398**
		P-value (2-tailed)	0.000	0.000	0.000

Table 8 shows the Correlation of the THQ-CK total score and its factors with the TPFQ-CK total score, bilateral PTA (pure-tone average), level of tinnitus annoyance and level of tinnitus loudness.

[Table 3](#) contains the scores for each of the questions in the THQ-CK and their correlations with the total score. The correlations between the questions of the THQ-CK and the total score ranged from 0.127 to 0.81 with a median value of 0.557 ([Table 3](#)). The Cronbach's alpha coefficient for all items (questions) was 0.926.

Test-retest reliability. We used the Kolmogorov-Smirnov and Shapiro-Wilk tests to assess the distribution of our data. Both tests confirmed that our data were not normally distributed ([Table 4](#)).

To assess test-retest reliability, we employed the Spearman's correlation coefficient. We chose to use this measure because of non-normal distribution pattern of our data. A Spearman's correlation coefficient that is close to one and has a significant p-value indicates that there is a strong direct relationship between individual scores on the assessments, suggesting that the scores are generally stable. The test-retest reliability of the TPFQ-CK is shown in [Table 5](#) and is evaluated as excellent.

Validity

Factor structure. According to the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test, our data appear well suited for factor analysis. The KMO value of 0.928 indicates that the sample is sufficient and the low p-value from the Bartlett's test suggests that the correlations between the variables are statistically significant, thereby confirming the eligibility of conducting factor analysis.

Questionnaire items with high communality (close to 1), such as Q15, Q22, Q14, Q17, Q18, Q19, Q21, suggest that they are well represented by the extracted factors. The factors explain most of the variance in these items. Items with medium communality (between 0.5 and 0.7), such as Q1, Q2, Q6, Q11, Q16, Q27, indicate moderate fit to the factors. Items with low communality (below 0.5), such as Q3, Q5, Q9, Q10, Q12, Q23, Q24, Q25, Q26, suggest that these items have a smaller overlap with the factors ([Table 6](#)).

Principal component extraction was employed to conduct the factor analysis. Five factors were identified that had eigenvalues greater than 1, according to the Kaiser's criterion. Eigenvalues quantify the amount of variability in the items that can be

explained by a particular factor. However, the scree plot based on our data suggested that the optimal number of components would be three ([Figure 1](#)).

Once the decline stops and the curve begins to bend at a less steep angle, subsequent components following the initial bend can be removed.

We performed an oblique rotation of the factor loading matrix to simplify its format and to examine the potential relationships between the three components. [Table 7](#) displays the factor pattern matrix after oblique rotation. Factor 1 had a strong correlation with nineteen items, factor 2 had a strong correlation with five items, and factor 3 had a strong correlation with four items. The analysis showed that factor 1 represented the impact of tinnitus on patients' social (questions 2, 4, 7, 23, 24, and 26), emotional (questions 8, 13, 15, 16, 17, 19, and 27), and physical behavior (questions 9, 11, 14, 18, and 25, as well as questions 2, 10, 26). Factor 2 included items that assessed patients' hearing abilities (6, 12, 20, 21, and 22), while factor 3 included patients' views regarding tinnitus (questions 1, 3, 5, and 8).

Our factor 1 covers original factor 1 and three items of factor 2, while our factor 3 is represented solely by the original factor 3. In the Kurdish version, the effects of tinnitus on patients' social, emotional, and physical behaviors, as well as their hearing abilities, are intertwined and mutually influence each other.

Construct validity. The Spearman's correlation coefficient was obtained by comparing the central kurdisch version of the THQ total score and TPFQ. [Figure 2](#) shows a robust correlation of 0.757 between THQ-CK and TPFQ-CK. A statistically significant relationship was found between the THQ-CK total score and its factors with TPFQ-CK ($r=0.757, 0.719, 0.719$, and 0.509 ; $P<0.001$). No significant relationship was revealed between the bilateral pure-tone average (PTA) and THQ-CK total score, as well as factors 1, 2, and 3. A moderate correlation was observed between the level of tinnitus annoyance and THQ-CK total score, along with factors 1, 2, and 3 ($r=0.497, 0.438, 0.438$, and 0.451 ; $P<0.001$). A moderate correlation was observed for the level of tinnitus loudness with THQ-CK total score and factor 3 ($r=0.451$ and 0.478 ; $P<0.001$), but only a weak correlation with factors 1 and 2 ($r=0.398$ and 0.398 ; $P<0.001$) ([Table 8](#)).

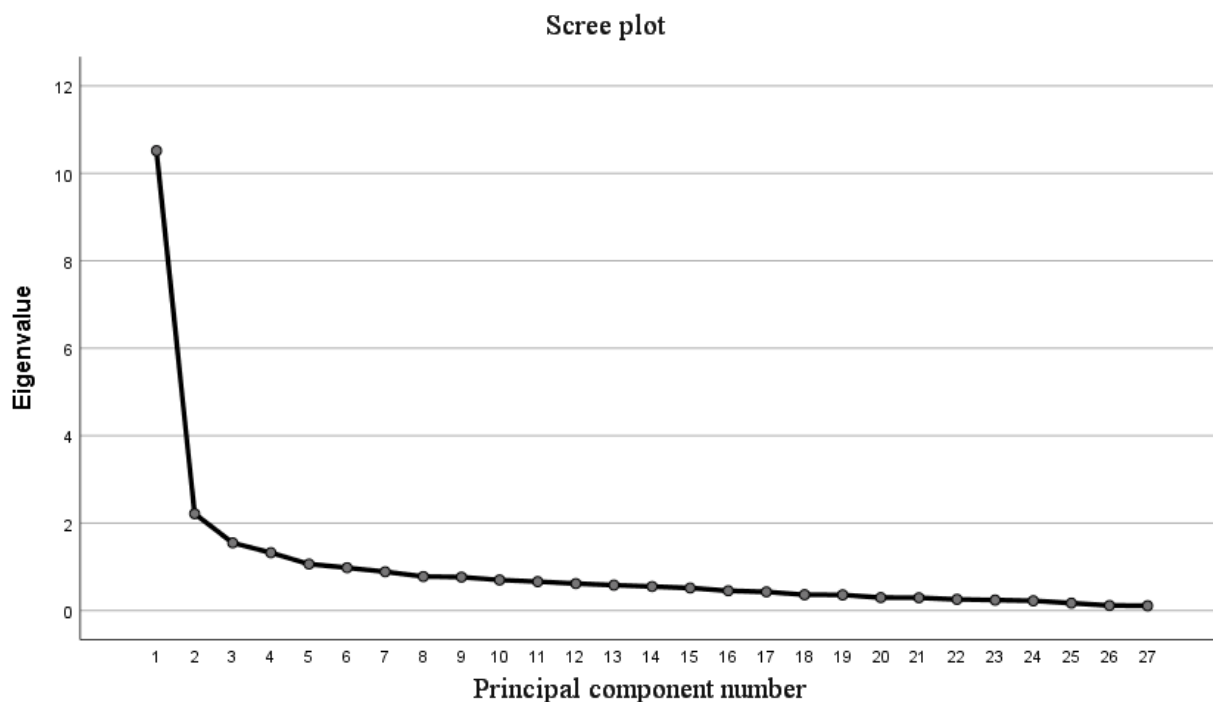


Figure 1. Scree plot: a graph of eigenvalues against the corresponding principal component number.

Once the decline stops and the curve begins to bend at a less steep angle, subsequent components following the initial bend can be removed. Generally, a scree plot displays the number of components and their corresponding eigenvalues. This particular scree plot suggests that the optimal number of components is three.

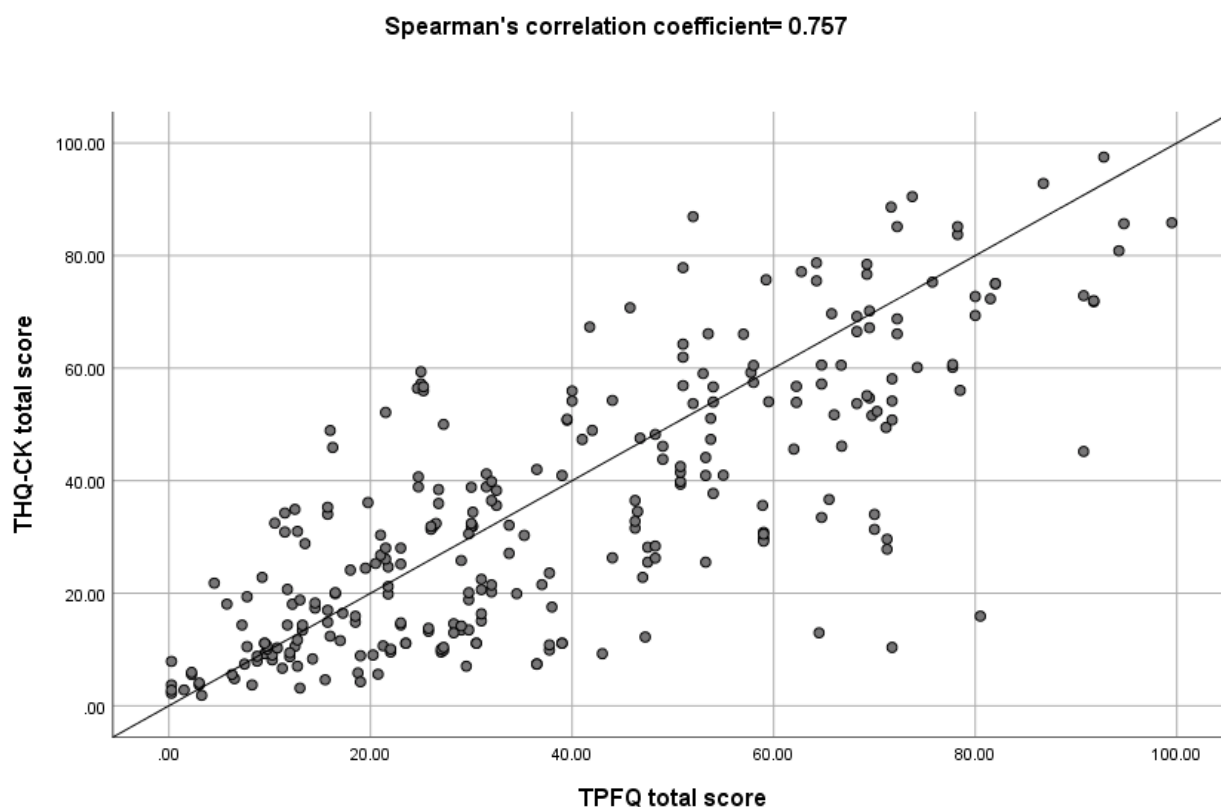


Figure 2. Correlation of the THQ-CK total score with TPFQ total score.

A Spearman's correlation coefficient was obtained by comparing the total score of the central kurdish version of the THQ and TPFQ. Figure 2 demonstrates a strong correlation between the central kurdish version of the THQ and TPFQ (0.757).

Discussion

The goal of this study was to evaluate the reliability and validity of the Central Kurdish version of the Tinnitus Handicap Questionnaire (THQ-CK). Our results showed that the THQ-CK demonstrated both reliability and validity comparable to its English counterpart.

Cross-cultural adaptation of the THQ is essential to ensure its effectiveness in different linguistic and cultural settings. This study aimed at adapting the THQ to a different cultural and linguistic context while maintaining its psychometric properties. The linguistic and cultural adaptation approach followed by us adhered to strict criteria that included careful translation, back translation, and evaluation by an expert committee. The questionnaire was carefully maintained to ensure its semantic, idiomatic, and conceptual consistency across multiple languages. Our study shows that the translated THQ maintains linguistic and cultural relevance, allowing for meaningful cross-cultural comparisons [22]. We evaluated the translated version of the THQ-CK to ensure its reliability and validity. The results of our study demonstrate the effectiveness of this method in assessing the outcomes of Kurdish-speaking individuals in Iraq suffering from subjective tinnitus.

We also discovered that the THQ-CK has excellent reliability. Internal consistency was determined using Cronbach's alpha [17]. The results of this study showed that the 27-item THQ exhibits a high level of internal consistency with a Cronbach's alpha coefficient of 0.926. This indicates that the questionnaire consistently produced similar answers when administered in the same context. Cronbach's alpha values of other THQ versions were as follows: 0.94 for English version [9], 0.96 in Korean version [23], 0.9 (French version) [24], and 0.93 for the Dutch version [25].

The item-total correlations were generally strong, with Cronbach's alpha values for each item showing good consistency (except items 1 and 8 with a weaker direct correlation. S. Vanneste et al. presented similar findings [25].

The Cronbach's alpha coefficient for the THQ-CK total score was 0.833. The Cronbach's alpha subscale values for factors 1, 2, and 3 were 0.949, 0.959, and 0.960, respectively, i.e., all exceeding 0.9. These findings were similar to the Persian version, except for factor 3: in that version, the Cronbach's alpha coefficient values for factors 1 – 3 were 0.95, 0.95 and 0.25 [26]. In Kuk et al., the Cronbach's alpha coefficient for factor 1 was similar (0.95), while for factors 2 and 3, alpha values were much smaller (0.88 and 0.47) [9]. This may be due to the following reasons: our translation may have improved the clarity and comprehension of the items in factors 2 and 3, leading to higher internal consistency among respondents, while the cultural nuances and linguistic adaptations in the translation process may have led to a better fit for the Kurdish-speaking population, contributing to higher internal consistency.

We used Kolmogorov-Smirnov and Shapiro-Wilk tests to assess the distribution of our data [27]. Both tests showed that our data were not normally distributed ([Table 4](#)). Accordingly, we used Spearman's rho to assess the correlation between the items. The Spearman correlation for the test-retest reliability of the THQ-CK total scores, factor 1, and factor 2 was 0.992, 0.999 and 0.999, respectively, which implies excellent reliability. This finding is consistent with the results obtained by Kuk et al. [9] and Arian Nahad et al. [26]. However, correlation for factor three was assessed at 0.666. The study by Newman et al. assessed the test-retest stability of THQ focusing on the minimal contribution of

memory. They revealed strong correlation for most of the factors except factor 3 [10]. Furthermore, the 4–7-day interval between test and retest of the THQ-CK demonstrated that except factor 3, no other components were affected by the very short time interval between the two administrations.

To assess face validity, the THQ-CK and a 5-point rating scale from 1 (extremely difficult to understand) to 5 (very easy to understand) were employed to identify potential language and comprehension difficulties. Fifty-two individuals participated in our study, including 26 subjects without previous hearing loss or tinnitus and 26 patients with tinnitus. Each participant individually read and completed the response to each item of the THQ questionnaire and then rated each item in terms of the ease of comprehension. All participants assigned scores of either 4 (easy to understand) or 5 (very easy to understand) to all THQ items. Similar procedures and results were achieved by Arian Nahad et al. [26].

Content validity is an essential factor in adapting questionnaires. An expert committee consisting of multilingual experts specializing in otolaryngology, audiology, psychology, and linguistics played a critical role in ensuring that the modified THQ retained the content validity of the original version. The inclusion of expert perspectives facilitated the detection and resolution of any linguistic or cultural subtleties affecting the clarity or appropriateness of the questionnaire [28].

According to the results of the KMO and Bartlett's test, our data appear well suited for factor analysis. The KMO value of 0.928 indicates that the sample is sufficient, and the low p-value from the Bartlett's test confirms that the correlations between variables are statistically significant, thereby substantiating the use of factor analysis [15].

Factor analysis was conducted to assess construct validity [20], which revealed a three-factor structure reflecting the impact of tinnitus on social, emotional and physical behavior (factor 1), its impact on hearing (factor 2) and the patient's understanding of tinnitus (factor 3). This factor structure is consistent with the original three-factor structure of the THQ, implying cross-cultural validity [9].

To assess construct validity, we used the Spearman's correlation coefficient to compare the THQ-CK total score with the TPFQ-CK [21]. A strong correlation (0.757) was revealed between the THQ-CK and TPFQ-CK total scores, as shown in [Figure 2](#). Factors 1, 2, and 3 demonstrated strong correlation with the THQ ($r=0.757, 0.719, 0.719$ and 0.509 ; $P<0.001$). A moderate correlation was observed between the level of tinnitus annoyance and THQ-CK, factor 1, factor 2, and factor 3 ($r=0.497, 0.438, 0.438$, and 0.451 ; $P<0.001$). A moderate correlation was observed for the level of tinnitus loudness with THQ-CK and factor 3 ($r=0.451$ and 0.478 ; $P<0.001$), while a weak correlation with factor 1 and factor 2 was established ($r=0.398$ and 0.398 ; $P<0.001$). Vanneste et al. and Arian Nahad et al. detected a moderate correlation for the tinnitus annoyance level with factors 1, 2, and 3 [25, 26].

As for discriminant validity, no significant association was found between the bilateral PTA and the THQ-CK total score, factor 1, factor 2, and factor 3. These findings supported the results of Arian Nahad et al. [26], thereby suggesting discriminant validity.

Limitations and advantages of the study

The study sample was limited to the Sulaymaniyah Governorate in Iraq, which may limit the applicability of the results to other Kurdish-speaking populations. Cultural nuances and differences in understanding tinnitus may exist among Central Kurdish speakers, thereby influencing their responses to the questionnaire.

The advantage of our study is that having a validated instrument in Central Kurdish allows researchers and clinicians to assess the impact of tinnitus on individuals in this specific cultural and linguistic context. The THQ-CK may facilitate cross-cultural tinnitus research and help in developing targeted interventions for individuals speaking Central Kurdish.

Conclusion

The evaluation of the validity and reliability of the THQ-CK shows that it is an excellent tool for assessing the impact of tinnitus on individuals speaking Central Kurdish. The study provides significant insights into the field of tinnitus research and paves the way for future cross-cultural studies.

Acknowledgments

We would like to thank all the participants in this study and all those who supported us with even one word in carrying out our research.

Conflict of interest

The authors declare no conflicts of interest.

Ethical approval

The Research Ethics Board of Sulaymaniyah University provided ethical permission prior to the recruiting of prospective participants (No. 7/29-4758-1 approved on April 18, 2022). All participants were required to provide written informed consent before data collection commenced. The study was conducted in compliance with the Declaration of Helsinki.

Data availability statement

The datasets used and/or analyzed in this study are available from the corresponding author upon reasonable request.

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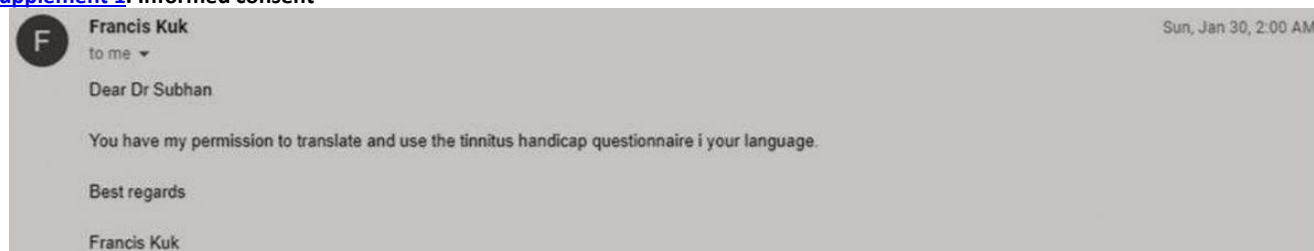
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Supplement 1. Informed consent



Supplement 2. Expert endorsement of the Centrak Kurdish version of the THQ-CK

Validity and reliability of the Central Kurdish version of the Tinnitus Handicap Questionnaire (THQ-CK)

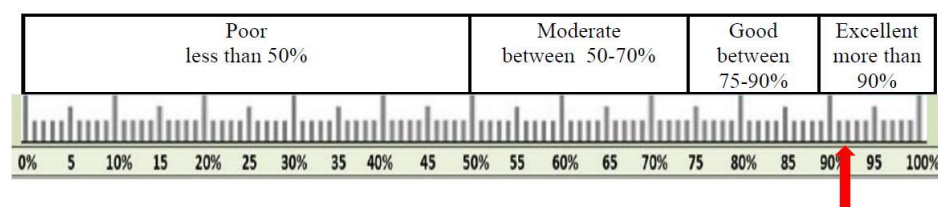
Focus group and Expert Committee

We our names and signatures below, members of the focus group and consultants in the field of Tinnitus, Otolaryngology, Audiology and Translations.

Hereby certified that under our supervision and participation and in accord with international guidelines; the translated Central-Kurdish version of Tinnitus Handicap Questionnaire has subjected to all stages of Cross-Cultural adaptation. The process witnessed four detailed panel discussions and it was completed by scoring of the 27 questions on the scale by all members using a subjective self-rating visual analogue scale demonstrated below.

Note: The result of scoring will identify the face and content validity of the translated instrument.

members of the focus group must compare translated questions with the original one.



Name and signatures of members:			
	Name	Specialty	Signature
1	Muaid ISuaid Aziz	ENT	
2	Omed Hameed Ali	ENT	
3	Sarwat T. San-Ahmed	ENT	
4	Ameer Asaad Muhammed	ENT	
5	Sherkho Saeed Zmuro	Consultant	
6	Huner Mohamed Hama Ameen	Otolaryngologist	
7	Bafin Ghafor Majeed	ENT - SHO	
8	Hawkar Ali Ahmed	Otolaryngologist	
9	Taha Jalal	English lecturer in University of Erbil	
10	Omer Fouad Ghafor	Ass. prof. English	
11	Shkar NZar	Otolaryngologist	
12	Mahdi Khaleel Fatah	English translator	
13	Mohammed Nidham Abdulullah	English translator	

Supplement 3. The final version of the THQ-CK

ژماره:

ناو:

Tinnitus Handicap Questionnaire

پرسیارنامه دهرباره ی ئه و کیشه (عاقه) انه ی زرنګانه وه ی گوی دروستیان ئه کات

رینماپی

ئهم راپرسییه پیکهاتووه له (۲۷) پرسیار. نکایه له نیوان ژماره (۰) تا (۱۰۰) ژماره یه ک دابی. (۰) واته به تهواوی نارازیم و (۱۰۰) واته به تهواوی رازیم. نکایه هیچ پرسیارنیک به جی مه هیله.

ژ	پرسیار	100 - 0
1	له کیشه ی زرنګانه وه ی گوتمدا هاوړنکام یارمه تیده رمن.	
2	زرنګانه وه ی گوی کیشه ی خیزانی دروست ده کات.	
3	زرنګانه وه ی گوتم سال به سال خراپتر ده بیت.	
4	به بونه ی زرنګانه وه ی گوتمه وه خوښی له له ژیان نابینم .	
5	خه لک به گشتی نازانن که زرنګانه وه ی گوی چهنده ییزارکهره.	
6	به هو ی زرنګانه وه ی گوتمه ناتوانم حالی بم له گفتوګودا له کاتی کوپونه وه کاند.	
7	زرنګانه وه ی گوی کاری کردووه ته سهر په یوه ندیه کو مه لایه تیه کانم.	
8	پیم وایه که تپروانینیک تهنروستم هه به دهرباره ی زرنګانه وه ی گوی.	
9	به هو ی زرنګانه وه ی گوتمه ناتوانم ته رکیز بکهم.	
10	زرنګانه وه ی گوی وام لی ده کات که دور بکه ومه وه لهو شوینانه ی ده نگه ده نگی تیا په .	
11	زرنګانه وه ی گوی وات لی ده کات که به گشتی هه ست به ناسا غی بکه یت.	
12	زرنګانه وه ی گوی وام لی ده کات که نه توانم بلیم ده نگه کان له کوتمه دین.	
13	زرنګانه وه ی گوی هه راسان (آزعاج) م ئه کات.	
14	به هو ی زرنګانه وه ی گوتمه وه ناتوانم ئیسراحت بکهم.	
15	زرنګانه وه ی گوی وام لی ده کات که هه ست به نااارامی بکهم.	
16	زرنګانه وه ی گوی وام لی ده کات که هه ست به دلخواه ی (قهله قی) بکهم.	
17	زورجار هه ست به به ییزاری ئه که م به هو ی زرنګانه وه ی گوتمه وه.	
18	زرنګانه وه ی گوی وام لی ده کات هه ست به ماندوویتی بکهم.	
19	زرنګانه وه ی گوی ده بیت هه ی ئه وه ی که هه ست به دنته نگی بکهم.	
20	زرنګانه وه ی گوی کار ده کاته سهر توانای تیگه یشتنم له قسه کاتیک که گوی له ته له فزیون ده گرم.	
21	زرنګانه وه ی گوی بوته هو ی که مپونه وه ی توانای تیگه یشتنم له قسه .	
22	زرنګانه وه ی گوی کار ده کاته سهر توانای تیگه یشتنم له قسه کاتیک که له ژورنیک قهره بانغدا قسه له گهل که سیکدا ده که م.	
23	بوم دهرکه وتووه که زه حمه ته بو که سانی تری روون بکه ومه وه که زرنګانه وه ی گوی چپیه.	
24	سکالا و گله ی زور ئه که م به هو ی زرنګانه وه ی گوتمه.	
25	شهوانه به زه حمت خه وم لی ئه که ویت به هو ی زرنګانه وه ی گوتمه.	
26	هه ست به ناره حه تی ده که م له بونه کو مه لایه تیه کاند به هو ی زرنګانه وه ی گوتمه.	
27	زرنګانه وه ی گوی فشاری دهرونی دروست ده کات.	