ORIGINAL ARTICLE
J Audiol Otol 2023 Jun 22 [Epub ahead of print]
pISSN 2384-1621 / eISSN 2384-1710
https://doi.org/10.7874/jao.2022.00521

Validation of the Sinhala Version of Tinnitus Handicap Inventory

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Received November 29, 2022
Revised January 19, 2023
Accepted February 3, 2023

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Background and Objectives: Tinnitus is a common and disabling condition that largely remains undertreated in Sri Lanka. Currently, standardized tools that assess and monitor the treatment of tinnitus or the distress it causes are unavailable in either of the two main vernacular languages prevalent in Sri Lanka. The Tinnitus Handicap Inventory (THI) is used internationally to measure tinnitus-induced distress and to monitor treatment efficacy. In this study, we validated the Sinhala version of the THI (THI-Sin). **Subjects and Methods**: The THI was translated into Sinhala and back translated into English and finalized by independent translators. The THI-Sin questionnaire and the 12-item General Health Questionnaire (GHQ-12) and Visual Analog Scale of tinnitus annoyance (VAS) were administered to 122 adults who visited the otolaryngology clinic of Colombo North Teaching Hospital, Ragama, Sri Lanka. **Results**: THI-Sin scores showed satisfactory internal consistency (Cronbach's α=0.902) and were significantly correlated with the GHQ-12 and VAS scores. Factor analysis of the THI-Sin confirmed a three-factorial structure, which did not correspond to the original THI subscales. **Conclusions**: We observed significant reliability and validity of the THI-Sin tool for evaluation of tinnitus-induced handicaps among the Sinhalese-speaking population of Sri Lanka.

Keywords: Tinnitus; Tinnitus Handicap Inventory; Validation; Sinhala; Sri Lanka.

Introduction

Tinnitus is a perception of noise or ringing in the ear(s), which affects 10%–20% of the adult population during their lifetime [1]. Tinnitus can seriously affect role functioning and quality of life [1]. It is often associated with psychological conditions such as anxiety and depression [2]. Comorbidities will add to the burden of tinnitus and further exacerbate tinnitus; hence, the association is bidirectional [3-5]. Severe annoyance associated with tinnitus is linked to increased suicide [2]. While prevalence of tinnitus in Sri Lanka is not known, it is estimated that least 2 million Sri Lankans experience tinnitus during their lifetime [6]. A Sri Lankan study found that 82.5% reported functional impairment due to tinnitus and 61.5% were found to have depression [6]. Tinnitus remains an undertreated condition in Sri Lanka in spite of its high prevalence, and associated impairment at least in part due to failure to identify the impact of tinnitus [6].

Papitsi, et al. [7] reported that questionnaires are the easiest and most effective tool for quantifying the impact of tinnitus in day-to-day life. Tinnitus Handicap Inventory (THI), is a widely used questionnaire to measure distress caused by tinnitus and efficacy of its treatment [8-13]. The THI has high internal consistency, test-retest reliability, and construct, concurrent and discriminant validity [14]. THI has been translated into various languages and it has demonstrated adequate reliability and validity in all these translations. There are currently no standardized questionnaires that have been validated in Sri Lanka for the assessment of tinnitus or the distress it causes. There are two main vernaculars in Sri Lanka—Sinhala and Tamil. This study aimed to validate the THI among a Sinhala-speaking study population in Sri Lanka. A validated Sinhala version of the tool would enable Sri Lankan clinicians to measure severity of and impairment of tinnitus patients and assess treatment success. This would also assist Sri Lankan researchers to study this area which has very little local literature.

Subjects and Methods

Ethical consideration

Permission to validate THI in Sri Lanka was obtained from the original author of the THI, Dr. Newman. Ethics approval to conduct this study was granted by the Ethics Review Committee of the Faculty of Medicine, University of Kelaniya, Sri Lanka (P/239/09/2017). Informed consent was obtained from all the participants.

Translation of the THI, English into Sinhala

The process of translation followed the steps recommended by Hall, et al. [15]. These steps included preparation, translating the source language into the target language, translating the target language back into the source language, committee review, field testing, reviewing, and finalizing the translation. The original English version of THI was translated independently into the Sinhala language by three bilingual health professionals. The three translators made a pooled version from the translations. A professional translator blinded to the original questionnaire back translated the Sinhala THI to English. The original questionnaire and the back translation were compared for coherence and necessary adjustments were made. The draft Sinhala translation was provided to 20 audiology students of the Faculty of Medicine, University of Kelaniya, Sri Lanka, who speak Sinhala as their native language. They were asked to comment on the coherence of the questioning and further improvements. Their comments were used in finalizing the Sinhalese version of THI (THI-Sin). All changes made to the Sinhala version even at the later stages were also back translated to English and assessed for coherence.

Participants

Finalized Sinhala THI was administered to 122 adult patients conveniently selected from the outpatient otolaryngology clinic at the Colombo North Teaching Hospital, one of the biggest tertiary care hospitals in Sri Lanka with 1,442 beds. Clinic attendees with complaints of chronic unilateral or bilateral tinnitus lasting for at least 6 months were invited for the study and written consent obtained from all participants.

Ten conveniently selected participants were asked to comment on the coherence of the questionnaire and further ways to improve the questions.

Study measures

Study participants were invited to complete the THI-Sin and 12 items of the General Health Questionnaire (GHQ-12) as well as Visual Analog Scale (VAS) of self-perceived tinnitus annoyance. Questionnaires were distributed among the participating patients after obtaining informed consent. Questionnaires were collected on the same day.

THI

The THI is a self-report measure with 25 items to assess tinnitus-related functional impairment (11 items), catastrophic thinking (five items), and emotional responses (nine items). Each question can be answered "yes" (4 points), "sometimes" (2 points), or "no" (0 points), with a worst possible total of 100 points.

GHQ-12

The GHQ-12 is a commonly used measure to identify potential non-psychotic mental health problems. The GHQ-12 is used to assess short-term psychological disorders/distress in the community or general hospital settings [16]. The GHQ-12 has high internal consistency; test-retest reliability; and construct, concurrent, and discriminant validity.

VAS

The VAS is a valid and effective measure of tinnitus severity with self-perceived tinnitus annoyance [17]. This scale consisted of a horizontal 5 cm line with marked endpoints designated as not annoying and extremely annoying which corresponded with scores of 0 and 5, respectively.

Statistical analysis

Statistical Package for the Social Sciences (SPSS) version 22 (IBM Corp., Armonk, NY, USA) was used to analyze data. Item characteristics were explored with frequency, mean and standard deviation (SD) of the item as well as item-total correlation while means scale of the item-item correlations were computed to determine scale characteristics. Internal consistency and reliability of the THI was assessed using Cronbach's alpha. Criterion validity was calculated by using a person's correlation coefficients. Principal component analysis with varimax rotation was used to validate the THI-Sin factor structure. A factor analysis was performed adopting the principal component factor analysis with varimax rotation to examine whether the data could verify three subscales in the original version of THI proposed by Newman, et al. [18].

Results

Of the 122 patients studied, the majority were males (66, 54.1%). The age of participants ranged from 18 to 83 years with average of 53.8 years (SD, ±16.15). Mean total THI score was 50.9 (SD, ±23.35) and almost half of the participants (44.3%) had severe handicap due to tinnitus. Most of participants (66.4%)

scored above cut-off of GHQ-12 suggesting psychiatric caseness.

THI-Sin has good internal consistency with Cronbach's alpha coefficient of 0.902. Coefficients for functional, emotional, and catastrophic were 0.793, 0.776, and 0.742, respectively. Table 1 presents item-total statistics which indicates removal of any item would result in a lower coefficient.

THI-Sin has a satisfactory item homogeneity with mean inter-item correlation of 0.353. The lowest correlations was in item 7 (0.292) while the highest in item 4 (0.629). Table 1 also presents means, standard deviations, and corrected item-total correlations of the 25 items of THI-Sin. The highest mean scores were recorded in item 17 ("Do you feel that your tinnitus has placed stress on your relationship?") and item 9 ("Does your tinnitus interfere with your ability to enjoy social activities?"). Lowest mean scores were recorded in item 6 ("Do you complain a great deal about your tinnitus?") and item 4 ("Does your tinnitus make you feel confused?").

Strong positive Spearman's correlations for the total THI-Sin score and VAS (ρ=0.90, p<0.01) and GHQ-12 (ρ=0.34, p< 0.01) confirmed convergent validity.

Suitability of data and sample adequacy for factor analysis were confirmed by Bartlett's test of sphericity (df=300, p< 0.001) and Kaiser-Meyer-Olkin test (MSAs 0.816). Table 2 presents a three-factor solution with first extracted factor with an eigenvalue of 7.796 explaining 31.185% of the variance. Second and third extracted factors recorded eigenvalues of 2.852 and 1.613 which explained 11.409% and 6.452% of variance, respectively.

Selected patients were interviewed regarding their experiences with THI-Sin. All patients reported that all the items in THI-Sin were clear to them and further modifications are not necessary.

Table 1. Corrected item-total correlations, internal consistency, reliability and means of the THI items

	Mean	Std. deviation	Corrected item-total correlation	Cronbach's alpha if Item deleted
THI Item 1	1.60	0.822	0.406	0.900
THI Item 2	1.83	0.907	0.295	0.902
THI Item 3	1.71	0.861	0.447	0.899
THI Item 4	1.58	0.814	0.629	0.895
THI Item 5	2.04	0.916	0.486	0.898
THI Item 6	1.56	0.763	0.528	0.897
THI Item 7	1.70	0.900	0.292	0.902
THI Item 8	1.73	0.847	0.625	0.895
THI Item 9	2.49	0.818	0.437	0.899
THI Item 10	1.72	0.839	0.627	0.895
THI Item 11	2.12	0.887	0.443	0.899
THI Item 12	2.32	0.839	0.491	0.898
THI Item 13	1.93	0.901	0.515	0.897
THI Item 14	1.86	0.859	0.611	0.895
THI Item 15	2.31	0.855	0.469	0.898
THI Item 16	1.74	0.824	0.623	0.895
THI Item 17	2.75	0.609	0.437	0.899
THI Item 18	2.30	0.872	0.603	0.895
THI Item 19	1.75	0.819	0.582	0.896
THI Item 20	2.22	0.851	0.373	0.900
THI Item 21	1.78	0.861	0.555	0.896
THI Item 22	2.10	0.831	0.557	0.896
THI Item 23	2.00	0.837	0.637	0.895
THI Item 24	2.11	0.874	0.335	0.901
THI Item 25	2.09	0.894	0.347	0.901

THI, Tinnitus Handicap Inventory

Discussion

The results of this study demonstrate that the THI-Sin is a reliable and valid tool to evaluate tinnitus-related distress and handicap. It has excellent internal consistency, satisfactory construct and criterion validity which are similar to the original version [18].

Psyhological morbidity reported in this sample is similar to the prevalence reported in Sri Lankan and international studies conducted in individuals with tinntius [6,19-28]. Severity of tinnitus in our sample is largely similar to other validation studies [20,28].

Higher item scores for stress on relationship and difficulty in social activities could be due to collectivistic nature of the Sri Lankan society. Minimal endorsement of items on complaining about tinnitus and feeling confused due to tinnitus may be due to stigma related to the illness. Latter phenomena will have an implication on treatment seeking behaviour in Sri Lanka.

Component analysis and factor loadings demonstrated three factors loadings of the 25 items, although these factors were different from subscales proposed by Newman, et al. [18]. The first factor loads on 11 items, all five items of catastrophic subscale, three factors each from emotional and functional subscales relating to mental health aspect such as depression, anxiety, anhedonia, helplessness, hopelessness, desperation, inability to cope and feeling trapped. Second factor loads on eight items, six items from functional scale and two items from emotional scale relating to impact of tinnitus on social and daily activities including socialization, relationships. The third factor loads on six items, four items from functional sub-scale and two items from emotional subscale relating to emotional and cognitive consequences of tinnitus such as poor concentration, irritability, and tiredness. Our fac-

Table 2. Rotated factor loadings of the three-factor solution

Scale	Item no and item	Factor 1	Factor 2	Factor 3
F	24. Does your tinnitus get worse when you are under stress?	0.772		
E	25. Does your tinnitus make you feel insecure?	0.770		
E	22. Does your tinnitus make you feel anxious?	0.670		
C	23. Do you feel that you can no longer cope with your tinnitus?	0.605		
C	19. Do you feel that you have no control over your tinnitus?	0.524		
E	21. Because of your tinnitus, do you feel depressed?	0.495		
C	11. Because of your tinnitus, do you feel that you have a terrible disease?	0.411		
C	5. Because of your tinnitus, do you feel desperate?	0.392		
F	12. Does your tinnitus make it difficult for you to enjoy life	0.375		
C	8. Do you feel as though you cannot escape your tinnitus?	0.334		
F	4. Does your tinnitus make you feel confused?	0.318		
E	3. Does your tinnitus make you angry?		0.792	
F	1. Because of your tinnitus, is it difficult for you to concentrate?		0.725	
F	7. Because of your tinnitus, do you have trouble falling asleep at night?		0.586	
F	13. Does your tinnitus interfere with your job or household responsibilities?		0.584	
F	2. Does the loudness of your tinnitus make it difficult to hear people?		0.516	
E	16. Do you complain a great deal about your tinnitus?		0.387	
F	9. Does your tinnitus interfere with your ability to enjoy social activities?		0.353	
F	17. Do you feel that your tinnitus has placed stress on your relationship?		0.294	
F	15. Because of your tinnitus, is it difficult for you to read?			0.747
F	18. Do you feel it difficult to focus your attention away from your tinnitus?			0.634
F	14. Because of your tinnitus, do you find that you are often irritable?			0.602
F	20. Because of your tinnitus, do you feel tired?			0.590
E	10. Because of your tinnitus, do you feel frustrated?			0.543
E	6. Does your tinnitus make you upset?			0.538

Scale categories F, C, and E represent tinnitus-related functional impairment (11 items), catastrophic thinking (5 items), and emotional responses (9 items), respectively.

tor analysis results are largely similar to analysis performed on the Polish version of the THI [24]. Factor analyses of several versions of THI including Cantonese, Danish, Italian, and Persian revealed unifactorial structures [20,22,25,28,29].

However, it should be noted that the external validity of THI-Sin may be limited due to probable sample bias with our study population consisting of an urban and semi urban population with relatively high health literacy which is not representative of whole of Sri Lanka. Further studies will be needed to assess the test-retest reliability, which when confirmed, will add important value to THI-Sin. In spite of this, THI-Sin is a measure with good psychometric properties which can be easily administered to quantify the impact of tinnitus in Sri Lankan clinical and research settings.

Acknowledgments

We acknowledge the support extended by otolaryngology surgeon Dr. M. Sheriff and the staff of the otolaryngology clinic in Colombo North Teaching Hospital. Further, we would like to offer our special thanks to Ms. Ramesha Madushani for her valuable support in the data collection of this study.

Conflicts of Interest

The authors have no financial conflicts of interest.

Author Contributions

Conceptualization: Asiri Rodrigo, Thilini Abayabandara-Herath. Data curation: Thilini Abayabandara-Herath. Formal analysis: Asiri Rodrigo, Thilini Abayabandara-Herath. Methodology: Asiri Rodrigo, Thilini Abayabandara-Herath. Project administration: Asiri Rodrigo, Thilini Abayabandara-Herath. Supervision: Asiri Rodrigo. Validation: Asiri Rodrigo. Writing—original draft: Asiri Rodrigo, Thilini Abayabandara-Herath. Writing—review & editing: Asiri Rodrigo, Thilini Abayabandara-Herath. Approval of final manuscript: Asiri Rodrigo, Thilini Abayabandara-Herath.

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