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Skarzynski Tinnitus Scale: Cultural Adaptation and Validation to Brazilian Portuguese

Milaine Dominici Sanfins[1,2] Caroline Donadon[3] Elżbieta Gos[2] Ana Paula Serra[4] Adriano Rezende[4] Natalia Ferrazoli[5,6] Piotr Henryk Skarżyński[2,7,8,9]

[1] Postgraduate Program in Audiology, Albert Einstein Instituto Israelita de Ensino e Pesquisa, São Paulo, SP, Brazil
[2] Department of Teleaudiology and Screening, World Hearing Center, Institute of Physiology and Pathology of Hearing, Kajetany, Poland
[3] Postgraduate Program in Child and Adolescent Health, Universidade de Campinas, Campinas, SP, Brazil
[4] Department of Otorhinolaryngology, Clínica Ouvire, Campinas, SP, Brazil
[5] Postgraduate Program in Health, Interdisciplinary Practice and Rehabilitation School of Medical Sciences, Campinas, SP, Brazil
[6] Departament of Audiology, Clinica Ouvire, Campinas, SP, Brazil
[7] Department of Heart Failure and Cardiac Rehabilitation, Institute of Sensory Organs, Warsaw, Poland
[8] Department of Otorhinolaryngology, Institute of Sensory Organs, Kajetany, Poland
[9] ENT Departament, Maria Curie-Sklodowska University, Lublin, Poland

Address for correspondence Caroline Donadon, PhD student, Rua Tessália Vieira de Camargo, 126, Cidade Universitária Zeferino Vaz, Campinas, SP, Brasil, CEP: 13083-887 (e-mail: caroldonadon.fono@gmail.com; carol_donadon@hotmail.com).

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Abstract

Introduction Tinnitus is a prevalent condition among many different populations. Since tinnitus is subjective, self-report questionnaires are one way of assessing how much the condition interferes with the quality of life of an individual.

Objective The aim of the present study was to translate and cross-culturally adapt the Skarzynski Tinnitus Scale (STS) into Brazilian Portuguese and validate its psychometric properties.

Methods The STS was translated and cross-culturally adapted using five main steps. Fifty-eight individuals who had continuous tinnitus were invited to complete the questionnaire. Pure tone audiometry (air and bone conduction) were also done.

Results No major changes were necessary in translating the scale. The overall score was 1.3 (range 0–4). Internal consistency was tested by Cronbach α, which ranged from 0.54 to 0.85. Differences between genders and between subscales and the total score were not significant. A statistically significant difference was only found in the coping subscale, in which normal hearing subjects had higher scores than those with hearing loss.

Conclusion The translation and adaptation of the STS established linguistic and cultural equivalence with the original. In addition, it exhibited good internal consistency. Our results suggest that the STS is suitable for use in a clinical setting.

Keywords
- tinnitus
- questionnaire
- translations
- hearing
- self-assessment
- hearing loss

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Introduction

Tinnitus is the auditory perception of a sound despite its physical absence.[1] It is commonly described as a squealing, buzzing, ringing, knocking, or hissing, among others. International epidemiological studies report a prevalence of 15% for tinnitus in the adult population,[2] and a national study reported a prevalence of 22%.[3] The condition can be severely debilitating for $\sim$ 1 to 2% of the population, affecting sleep, concentration, quality of life, and productivity.[4]

However, tinnitus is difficult to measure objectively because it is almost always a subjective phenomenon, and objective measures of tinnitus such as pitch or loudness only weakly correlate with the impact of tinnitus on various domains of life. Because of this, self-report tinnitus questionnaires are useful tools for measuring the impact of the condition on the life of a patient and have been applied in several ways in clinical practice and research.[5]

Most tinnitus questionnaires were developed in English, but several have been translated into other languages and validated. Cross-cultural adaptation is a more practical alternative than creating a new instrument,[6] since a variety of validated questionnaires that assess and quantify tinnitus is already available. Cross-cultural adaptation goes beyond translation: it considers aspects such as language, cultural context, and lifestyle, in addition to conceptual, semantic, and operational equivalences between versions in the source and target languages.[6]

The Skarzynski Tinnitus Scale (STS) is a brief and reliable questionnaire that can be used in a clinical population to assess tinnitus complaints in adults. The STS can be applied to patients, either with or without hearing impairment, who complain of tinnitus.[7] The questionnaire consists of 15 items divided into 3 domains: psychological distress (negative feelings connected with tinnitus, intrusive thoughts), functional (impact on everyday life), and coping with tinnitus-related distress (efforts to reduce the negative effects of tinnitus). It uses a Likert scale (0, definitely yes; 1, probably yes; 2, neither yes nor no; 3, probably not; 4, definitely not). The aim of the present study was to cross-culturally adapt the STS into Brazilian Portuguese and assess its reliability.

Method

Ethics

The present study was performed in a private audiological clinic located in Campinas, São Paulo, Brazil. The study was approved by the Ethics Committee on Research (number 4037271). Each participant gave written informed consent.

Participants

The sample comprised Brazilian Portuguese native speakers of both genders who filled in the questionnaire while waiting for a consultation with an audiologist. The main eligibility criteria were patients $>$ 18 years old, continual tinnitus of a duration of at least 3 months, and a lack of cognitive impairment as confirmed by the medical history of the patient. For all patients, pure tone averages (PTAs) were assessed for air conduction (0.25 to 8 kHz) and bone conduction (0.5 to 4 kHz) using a Callisto audiometer (Interacoustics, Denmark) in a soundproof booth. A pure tone average $<$ 25 dB HL was considered normal hearing, between 25 and 40 dB HL as mild hearing loss, and between 40 and 55 dB HL was considered moderate hearing loss.[8]

Translation

Written permission for the translation of the STS was granted from the source language questionnaire developer. The process of translation and cross-cultural adaptation followed the steps described below.

Two translators fluent in English translated the original version of the scale from English into Brazilian Portuguese, one of whom (T1) was familiar with the concepts covered in the questionnaire, while the other (T2) was not. The translators synthesized their translations into one agreed version (T-12) that was then backtranslated into its original language (English). This was a validation check to ensure that the translated version was an accurate reflection of the original. The backtranslations (BT1 and BT2) were produced by two translators who were also fluent in the source language (English). The two backtranslators were not aware of and were not informed of the concepts being quantified, and had no training in the health or education professions.

A committee of experts was then created, comprising an Otolaryngologist (ENT), audiologists, and the translators involved in the process. The committee aimed to consolidate all the versions and develop a final protocol version for field testing. The committee wanted to achieve equivalence between the source and target versions in terms of semantics, idiom, experience, and concepts. Before producing the final version, a prefinal version of the questionnaire was tested on volunteer clinic staff. A final report of the processes was shared with the source language questionnaire developer.

Statistical Analysis

Statistical analysis of the data was performed with the IBM SPSS Statistics for Windows ,version 24 (IBM Corp., Armonk, NY, USA). The mean and standard deviation (SD) of the items, subscales, and global scores were computed. The interitem correlations and correlations between the subscales and global scores were calculated. The correlation between the item and the total score was also calculated using the Pearson correlation coefficient. Significance level was set at 0.05. Cronbach α was calculated to measure internal consistency.

Result

Subjects

There were 58 participants, 34 females and 24 males, aged from 18 to 85 years old (mean = 52.5; SD = 15.2), 44% of whom had bilateral tinnitus. The results of PTA indicated that 26 participants (44%) had normal hearing in both ears.

Translation

The original, translated, and backtranslated versions of the STS questionnaire were compared and all disparities were eliminated; subsequently, the final translated version of the instrument was ready for use.

In the direct translation stage, phrasings of the two translators differed slightly, although the content was the same. A consensus wording was reached between the translator, the creator of the instrument, and the group of experts. During interviews with the pilot group, questions about two items were raised. The authors decided to change the wording of these items to improve semantic equivalence. In detail, items 3 and 5 were modified so that the level of the language was appropriate for end users. For item 3, we looked for a better synonym for "deal with", as some subjects in the pilot group had difficulty understanding what it meant; it was modified to the verb "support", then the subjects said that they understood it better. For item 5, we replaced "I had the feeling" with "I think."

No translation difficulties were encountered in relation to idiomatic equivalence, nor with experiential settings, since the instrument discusses everyday experiences common to both cultures.

Descriptive Analysis of STS Items

For each question, a minimum (min), maximum (max), mean (m), and SD were calculated (►**Table 1**). These items, as mentioned before, were recoded so that 0 was definitely yes; 1 was probably yes; 2 was neither yes nor no; 3 was probably not; and 4 was definitely not. The means of the items (M) were $\sim$ 1.3. The item with the highest mean was about tinnitus disturbing attention (M = 1.91), and the lowest was related to tinnitus and its interference with daily activities (M = 0.72). The skewness was < 1.0, and the kurtosis was generally < 1.0 as well, although, in a few cases, it was slightly > 1.0. ►**Table 2** summarizes the descriptive statistics of subscales (psychological distress, functional, and coping) and STS global score. Very strong positive correlations were found between the global score and the functional and psychological distress subscales. There was also a strong positive correlation between the STS global score and the coping subscale (►**Table 3**).

Internal Consistency

Cronbach α was calculated for each subscale and for the total score. For the Psychological distress subscale, α = 0,703; for the Functional scale, α = 0.689; for the Coping subscale,

Table 1 Descriptive statistics of STS items

Item	min	max	M	SD	Skewness	Kurtosis
Q1	0	4	1.72	1.387	0.313	−0.980
Q2.	0	4	0.78	1.140	1.342	0.812
Q3[a]	0	4	1.31	1.489	0.729	−0.875
Q4	0	4	1.29	1.463	0.756	−0.838
Q5	0	4	0.53	1.063	2.039	3.266
Q6[a]	0	4	1.79	1.620	0.271	−1.505
Q7	0	4	1.31	1.465	0.683	−0.908
Q8	0	4	1.57	1.416	0.431	−0.991
Q9	0	4	0.93	1.81	1.167	0.185
Q10	0	4	1.81	1.468	0.168	−1.301
Q11	0	4	1.45	1.646	0.633	−1.253
Q12[a]	0	4	1.91	1.302	0.115	−0.954
Q13	0	4	1.50	1.525	0.508	−1.222
Q14	0	4	1.02	1.304	1.097	0.091
Q15	0	4	0.72	1.136	1.389	0.903

Abbreviations: M, mean; max, maximum; min, minimum; SD, standard deviation.
[a]Items recoded.

Table 2 Descriptive statistics of subscales and global STS scores

Subscale	min	max	M	SD	Skewness	Kurtosis
Psychological distress	0,00	87.50	36.3506	22.49639	0.356	−0.578
Functional	0.00	75.00	24.9138	22.07426	0.600	−0.672
Coping	0.00	100.00	41.8103	26.60498	0.245	−0.801
STS global score	1.79	82.14	33.4360	20.16922	0.648	−0.461

Abbreviations: M, mean; max, maximum; min, minimum; SD, standard deviation; STS, Skarzynski Tinnitus Scale

Table 3 Correlations between subscales and global scores

Subscale	Functional	Coping	STS global score
Psychological distress	0.787**	0.450**	0.913**
Functional		0.558**	0.925**
Coping			0.716**

Abbreviation: STS, Skarzynski Tinnitus Scale.
**For all correlations $p < 0.01$

$\alpha = 0.538$; and for global STS, $\alpha = 0.846$. The STS global score and the Psychological distress subscale had extremely high consistency. The Functional subscale had good internal consistency; only the Coping subscale had a lower, questionable internal consistency. The internal structure was also analyzed using interitem correlations. Most of the interitem correlations were positive and statistically significant (except for items 1 and 5) and varied mostly between medium and strong (►**Table 4**).

Clinical Application

Differences between genders and subscale scores and between genders and the total score were not significant (►**Table 5**). When examining the distribution of the total scores, we observed that more than half of the participants had low scores (►**Table 6**).

To examine the effect of hearing loss, the sample was divided into 2 groups based on hearing status: 26 individuals with bilateral normal hearing (G1) and 8 individuals with bilateral hearing loss (G2). ►**Table 7** shows that a statistically significant difference was found only in the Coping subscale, in which normal hearing subjects had higher scores (poorer coping) than those with hearing loss.

Discussion

Various methods of measuring and evaluating tinnitus have been discussed over the years, noting that the perception of tinnitus by a patient can vary widely.[9] Documenting the characteristics of a population with tinnitus can help us appreciate the frequency range of tinnitus that a subject experiences.[10]

The proportion of females in the present study was similar to that in some other studies in which a greater proportion of females has been observed.[3,11,12] However, more generally, a wide spread in the gender ratios of patients with tinnitus has been found. Some studies in fact point to a higher prevalence in males.[9,13] When the severity of tinnitus is compared between genders, some see a higher prevalence in females,[14] some in males.[15]

We found that there was no statistically significant difference between genders. Another work using self-perception questionnaires to study tinnitus had a similar finding,[12,16] suggesting that gender does not generally affect the responses of a subject.

Table 4 Interitem correlations

Item	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Q1	1	0.449**	0.187	0.118	0.185	0.099	0.319*	0.367**	0.275*	0.224	0.463**	0.025	0.523**	0.342**	0.174
Q2.		1	0.424**	0.293*	0.376**	0.079	0.273*	0.320*	0.577**	0.257	0.242	0.306*	0.338**	0.109	0.398**
Q3 [a]			1	0.038	0.270*	0.311*	0.397**	0.406**	0.416**	0.404**	0.221	0.295*	0.510**	0.268*	0.373**
Q4				1	0.258	0.233	0.268*	0.104	0.413**	0.263*	0.549**	0.207	0.366**	0.402**	0.356**
Q5					1	0.188	0.196	0.004	0.246	0.010	0.242	0.199	0.211	0.347**	0.168
Q6 [a]						1	0.264*	0.312*	0.094	0.160	0.286*	0.241	0.270*	0.367**	0.188
Q7							1	0.209	0.534**	0.264*	0.232	0.115	0.432**	0.300*	0.368**
Q8								1	0.244	0.534**	0.356**	−0.078	0.419**	0.194	0.230
Q9									1	0.328*	0.281*	0.375**	0.422**	0.158	0.661**
Q10										1	0.442**	0.065	0.404**	0.359**	0.315*
Q11											1	0.125	0.559**	0.511**	0.124
Q12 [a]												1	0.287*	0.146	0.387**
Q13													1	0.587**	0.435**
Q14														1	0.228
Q15															1

[a]Items recoded.
*$p < 0.05$
**$p < 0.01$.

Table 5 Comparison between gender and STS subscales and global score

Subscale	Gender	n	Mean	SD	*p-value*
Psychological distress	F	34	37.25	21.830	0.719
	M	24	35.06	23.822	
Functional	F	34	25.58	22.588	0.785
	M	24	23.95	21.768	
Coping	F	34	42.15	25.700	0.907
	M	24	41.31	28.390	
STS global score	F	34	34.13	20.077	0.755
	M	24	32.44	20.689	

Abbreviations: F, female; M, male; n, number; SD, standard deviation; STS, Skarzynski Tinnitus Scale.
t-test for independent samples.
*$p < 0.05$

Table 6 Distribution of STS total scores based on grading system

Norms	n	Percentage (%)
Low (< 30 points)	31	53.5
Moderate (30 to 51 points)	15	25.9
High (51 to 72 points)	9	15.5
Very high (> 72 points)	3	5.1

Abbreviations: n, frequency; STS, Skarzynski Tinnitus Scale.

Tinnitus is a symptom that can be found in children as well as in the elderly. There seems to be a trend of an increase in prevalence with age.[2,9,17] However, one study found that after the 70 years old, the prevalence starts to decrease again.[9]

In our study, 44% of the subjects reported that they perceived tinnitus in the middle of the head or in both ears. This is a common finding.[18] The literature describes a consistent relationship between tinnitus and hearing loss,[17,19] probably because damage to the inner ear or to the cochlear nerve can generate tinnitus.[13] However, individuals with normal hearing can also report tinnitus.

Generally, the presence of tinnitus in subjects with normal hearing seems to be less frequent than in individuals with some degree of hearing loss,[20] although this is opposite to what we observed. Therefore, the presence of tinnitus in normal hearing individuals needs additional study. Our subjects who reported tinnitus had normal hearing thresholds and no detectable hearing loss in the frequency range of conventional audiometry.[19,21] The literature tends to believe that the symptom should be considered normal in normal hearing individuals. The argument is that PTA does not reliably predict cochlear damage in the coding of hair cells for frequencies > 8 kHz, and that central changes cannot be detected by conventional audiometry.[19] In the same way, subjects with normal hearing are more likely to be disturbed by tinnitus than tinnitus sufferers with hearing loss and, therefore, report it earlier.[13]

During the process of translation and cross-cultural adaptation of the questionnaire, we found some differences in the grammatical structure of the English and Portuguese versions, such as in items 3 and 5. In the process of culturally adapting the questionnaire, we developed versions that considered aspects that went beyond language, such as the cultural context in which the questionnaire was to be applied.[22] We believe that our introduction of these subtleties in the adaptation and translation process was rigorous, and followed best practice guidelines for translating hearing-related questionnaires.[6,23]

The average of the items that make up the scale was ~ 1.3, a value close to that found with the original scale (~ 2.0). In the 4-point Likert scale, the lower the score, the more positive is the attitude of the patient to the question. This means that the subjects in the present study seemed to deal better with tinnitus-related issues than the subjects used in the original version of the scale.

The symptoms of tinnitus can negatively affect different spheres of the life of an individual. In our study, its effect on attention was found to be the item with the highest average score. Our subjects reported that tinnitus impaired cognitive

Table 7 Comparison between hearing status, STS subscales, and global score

	Hearing status	Mean	SD	*p-value*
Psychological distress	Normal hearing in both ears	31.08	18.49	0.805
	Moderate severe in both ears	32.81	21.06	
Functional	Normal hearing in both ears	24.23	25.00	0.516
	Moderate severe in both ears	18.12	13.34	
Coping	Normal hearing in both ears	49.67	23.27	0.027*
	Moderate severe in both ears	28.12	22.24	
STS global score	Normal hearing in both ears	32.62	19.15	0.420
	Moderate severe in both ears	26.56	15.22	

Abbreviations: SD, standard deviation; STS - Skarzynski Tinnitus Scale.
t-test for independent samples.
*$p < 0.05$

function, increased irritability, and disrupted everyday activities, as well as generated psychological problems such as anxiety and depressive symptoms.[24,25]

Some authors[26,27] point out that cognitive functions, emotions, and coping strategies play an important role in how tinnitus is perceived. These negative affective states are associated with a worse quality of life.[28] The STS has four subscales that seek to gain information about the emotional, functional, and coping aspects of the tinnitus of a subject. The scale with the highest average score in our sample was the coping subscale, reflecting greater effort on the part of the individual to regulate the stressful situations triggered by tinnitus.[29]

One study of patients with chronic tinnitus showed that coping strategies focusing on emotions tended to increase the burden of tinnitus, while coping strategies focusing on the problem tended to lighten it.[30] Understanding how coping strategies affect the discomfort level of tinnitus can help in prescribing appropriate treatments. The Functional and Psychological distress subscales contributed the most to the global score, while the Coping subscale contributed the least, a finding similar to that found with the original scale.[7] In terms of reliability, the total score Cronbach α, as well as of all subscales, ranged from 0.85 to 0.54 for the Brazilian Portuguese version of the STS, compared with 0.91 to 0.62 for the original STS.

There is no standard cutoff on what is an acceptable value of Cronbach α; however, acceptable values in most studies range from 0.7 to 0.6.[31] Only the coping subscale had such a low α; this may be due to the low number of questions it contained. Perhaps dealing with tinnitus-related suffering is a complex issue and more complete details may be required to describe it accurately.[32]

Correlations between one item and another gauge the extent to which scores on one item relate to scores on all the other items, providing a measure of the redundancy of an item.[33] The Kappa coefficients of some items of the STS were < 0.30 (a value considered acceptable), indicating that there was a weak interitem correlation. Nevertheless, this result does not mean that the scale adaptation is unreliable. Low Kappa values can derive from variables that differ in time, that are not accurately recalled, or from the subject not properly understanding the question.[34]

In our efforts to measure the severity and negative impacts of tinnitus, we applied the scale to subjects both with and without hearing loss, helping to provide insight into the complex way that tinnitus interacts with psychological distress and quality of life.[35] The findings were that normal hearing subjects had a higher score (poorer coping) than those with hearing loss, suggesting that there is a significant difference in how the two groups cope with tinnitus. One hypothesis is that hearing loss, by itself, has social, behavioral, and emotional impacts, so that, from the point of view of an individual, the impact of tinnitus might be reduced by overcoming their hearing loss. In addition, individuals with normal hearing notice more their tinnitus, creating greater difficulty in dealing with tinnitus.

There are various ways of improving the present research in the future. Our sample consisted of patients with chronic tinnitus, so separate studies of patients with acute tinnitus are needed. More work is also needed to investigate the test-retest reliability of the Brazilian Portuguese version of the STS, since psychometric validation is an ongoing process that requires repeated application to diverse populations to provide solid evidence about the properties of the test method.

Conclusion

Our results suggest that the translated scale had linguistic and cultural equivalence with the original. It proved to be easy to understand and widely applicable. Internal consistency demonstrated that the scale can be used as a suitable instrument in a clinic, and can accurately assess the subjective level of tinnitus.

Additional Files

►**Appendix 1**: Skarzynski Tinnitus Scale in Brazilian Portuguese.

►**Appendix 2**: Skarzynski Tinnitus Scale in English.

Part of the results of the present study was presented in the 15th Congress of the European Federation of Audiology Society 2021.

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Conflict of Interests

The authors have no conflict of interests to declare.

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