Validity and Reliability of a Tamil Translation of the Tinnitus Handicap Inventory

Vidya Ramkumar & Swetha Swaminathan

Abstract

Self-rating questionnaires are often used to assess handicap due to tinnitus. These questionnaires should be administered in the respondent’s native language to obtain accurate responses. There is no known self-rating questionnaire in Tamil language to assess handicap due to tinnitus. Worldwide, the Tinnitus Handicap Inventory (THI) is one of the most-used questionnaires. The aim of this study was to validate a translated THI in Tamil. A total of 100 adults with and without hearing loss, in the age range of 18-60 years, and with a complaint of tinnitus for a minimum of 3 months, participated in the study. Validity of the THI-Tamil was tested by administering both THI-English and THI-Tamil to 60 of these participants who were equally fluent in English and Tamil. The remaining 40 who were fluent in Tamil, participated in the test re-test reliability study. Concurrent validity of the THI-Tamil was 0.99. Construct validity was 0.96. Internal consistency reliability of THI-Tamil was 0.98, and the three subscales (functional, emotional and catastrophic) were 0.97, 0.96 and 0.93 respectively. Thus, THI-Tamil is a valid and reliable tool.

Key words: Tinnitus, Self-rating Questionnaire, Internal Consistency, Construct Validity, Concurrent Validity

Tinnitus is the perception of sound for which there is no acoustic source external to the head (Henry, Dennis, & Schechter, 2005). Global epidemiologic studies, estimate the prevalence of tinnitus to be between 10%-15% (Sindhusake, Mitchell, Newall, Golding, & Rubin, 2003). Approximately 2% of the adult population has been reported to be afflicted by tinnitus in Sweden (Anderson, 2002). Tinnitus among children in Berlin was reported to be 102 out of 1420 children seen in hearing testing (Aust, 2002).

The relatively common occurrence of tinnitus may be attributed to its multiple aetiologies, such as ear wax, middle ear infection, otosclerosis or even cochlear hair cell damage, Tinnitus can also be idiopathic (Crummer & Hassan, 2004). Further, a strong association between occupational noise exposure and tinnitus is well-documented (Hoffman & Reed, 2004 as cited in Snow, 2004, p.17). Most individuals with tinnitus have associated hearing loss. A study by Silverstein, Arruda, and Rosenberg (1999), however, reveals that 20% to 30% of them have normal hearing sensitivity. Irrespective of hearing status, tinnitus affects individuals’ lives to varying degrees.

Tinnitus may be associated with disorders of sleep, lack of concentration, anxiety, and depression that sometimes lead to suicidal tendencies. The most frequently reported problems among 72 individuals suffering from tinnitus were: (a) trouble getting to sleep, (b) persistence of tinnitus, (c) difficulty understanding speech, (d) depression, (e) annoyance, (f) confusion, and (g) dependence on drugs (Tyler & Baker, 1983). Disturbances due to tinnitus are intensified as subjects concentrate more on the sound, and hence are constantly aware of it (Stouffer & Tyler, 1990). Tinnitus affects cognition to the extent that it reduces the cognitive capacity needed to perform tasks that require voluntary, conscious, effortful, or strategic control (Rossiter, Stevens, & Walker, 2006).

Information on the nature of an individual’s tinnitus may be obtained using case history (e.g. continuous or intermittent noise, type of tinnitus such as buzzing, ringing, roaring or hissing). Psychoacoustic characteristics of tinnitus such as intensity, frequency, and masking ability are obtained using intensity matching, pitch matching, minimal masking level, and residual inhibition. Although these measures are useful in describing tinnitus, psychoacoustic characteristics have low correlation with the extent of handicap in an individual’s life due to tinnitus (Newman & Sandridge, 2004).

Self-rating questionnaires often are used to study the impact of tinnitus. Questionnaires aid in planning treatment and in addressing specific concerns during the counselling process. Self-rating questionnaires are particularly useful in evaluating treatment outcome. In order to capture the nature of symptoms and tinnitus-related history, such questionnaires allow the individual to describe the subjective impact of tinnitus.

Some of the commonly used self-rating questionnaires used to obtain tinnitus severity ratings are described further. The Tinnitus Handicap Questionnaire (THQ) (Kuk, Tyler, Russell, & Jordan,
The Tinnitus Reaction Questionnaire (TRQ) (Wilson, Henry, Bowen, & Haralambous, 1991) evaluates 26 aspects of tinnitus-impact on quality of life, yielding a score between 0 and 104. A score >16 is considered clinically significant. The questionnaire has a test re-test reliability of 0.88 and an internal consistency of 0.96.

The Subjective Tinnitus Severity Scale (STSS) (Halford & Anderson, 1991) is a 16-item subjective tinnitus severity scale. Responses are in the form of "yes" or "no." The tool has an internal consistency of 0.84.

The Tinnitus Handicap Inventory (THI ; Newman, Jacobson, & Spitzer, 1996) is a self-reporting measure validated for quantifying the impact of tinnitus on daily living. This was developed in English language. The questionnaire consists of 25 questions in three subscale categories: functional, emotional, and catastrophic. Response choices are 'yes', 'no', or 'sometimes'. A "yes" response is awarded 4 points, a "no" response is awarded 0 points, and a "sometimes" response is awarded 2 points. Possible scores range from 0-100 with '0' indicating 'no perceived handicap' and 100 indicating a 'significant perceived handicap'. The degree of perceived handicap using THI is given in Table 1.

The functional subscale (10 items with a maximum score of 40), evaluates role limitations in the areas of mental, social/occupational, and physical functioning. The emotional subscale (10 items with a maximum score of 40) includes items representing a broad range of affective responses to tinnitus, including anger, frustration, irritability, and depression. The catastrophic subscale (5 items with a maximum score of 20) probes the most severe reaction to tinnitus such as desperation, loss of hope, inability to cope and fear of a grave disease. The scale has an internal consistency of 0.93. Among the self-rating questionnaires described above, the THI is most widely used and has been translated into languages such as Danish (Zachariae et al., 2000), German (Langguth et al., 2007), Italian (Monzani et al., 2008) and Brazilian-Portuguese (Schmidt, Teixeira, Dall'Igna, Dallagnol, & Smith, 2006).

Based on the clinical statistics register for the year 2010, approximately 14% of patients reporting to the audiology clinic at Sri Ramachandra University (SRU) in Chennai, India, underwent tinnitus evaluation. Currently, the protocol for tinnitus evaluation at SRU includes, psychoacoustic evaluation using an adapted version of the Vernon and Meikle (1981) procedure, and a rating of self-perception of tinnitus on a visual analogue scale ranging from 1 to 10 (‘1’ indicates least annoyance and ‘10’ indicates maximum annoyance). However, as explained previously, a self-assessment questionnaire provides greater and more detailed insight into areas that cannot be assessed by psychoacoustic evaluation procedures. They also explore the problems faced by the individual and serve as a baseline for assessing treatment outcomes.

Responses to self-assessment questionnaires are most accurate when administered in the native language of the individual. However, there has been no self-rating questionnaire in Tamil to assess handicap due to tinnitus. Tamil, one of the scheduled languages in India, is the Official language of the State of Tamil Nadu, Pondicherry, Andaman and Nicobar Islands and is spoken by over 61.5 million people in India. Further, approximately 5 million people speak Tamil in countries other than India such as Singapore, Malaysia, Sri Lanka, Mauritius, Thailand, Bahrain, UAE, USA and Canada (SIL International, 2009). These statistics suggests that Tamil is a widely spoken language.

As noted above, the THI is a widely used self-assessment questionnaire for tinnitus and has been translated into European and South American languages. It has a high internal consistency [THI-English (0.93), THI-Danish (0.93) and THI-Italian (0.92)], which suggests that it is applicable to various cultures. Hence, the THI English version was chosen (henceforth referred to as THI-English) to serve as a self-assessment questionnaire for translation and validation in Tamil (THI-Tamil).

The aim of this study was to obtain validity and reliability of a THI-Tamil. The specific objectives were to translate the THI-English to Tamil, and to test it for internal consistency, construct validity, concurrent validity, and test-retest reliability.

### Method

#### Translation procedure

The THI consists of 25 items with 3 sub-scales: functional, emotional and catastrophic. An individual proficient in both English and Tamil translated the

**Table 1. Rating scale of Tinnitus Handicap Inventory.**

<table>
<thead>
<tr>
<th>Degree of handicap</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight handicap</td>
<td>0-16</td>
</tr>
<tr>
<td>Mild Handicap</td>
<td>18-36</td>
</tr>
<tr>
<td>Moderate handicap</td>
<td>38-56</td>
</tr>
<tr>
<td>Severe handicap</td>
<td>58-76</td>
</tr>
<tr>
<td>Catastrophic</td>
<td>78-100</td>
</tr>
</tbody>
</table>

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THI-English into Tamil. Reverse-translation was done to check intactness of meaning. Three audiologists proficient in Tamil further verified the appropriateness of translation. A form with Tamil and English versions of all the 25 items was given to them. Each item was to be rated as either ‘appropriate’ or ‘inappropriate’. If an item was deemed inappropriate, the judges would have to suggest corrections. If two out of three judges found an item in the THI-Tamil, appropriate, the translation was considered correct. There was no item which all three judges rated as ‘inappropriate’. Inter-rater reliability was calculated using Fleiss’ Kappa (Table 2). The agreement percentage between the three judges was 86.7% (K=0.867) which suggests ‘near complete agreement’ on the appropriateness of translation among the three judges.

Participants

A total of 100 adults with and without hearing loss, in the age range of 18-60 years, and with a complaint of tinnitus for a minimum of 3 months, participated in the study. Sixty of these adults, who were equally fluent in English and Tamil served as participants for validation of THI-Tamil. The remaining 40 who were fluent in Tamil, participated in the test re-test reliability study.

Information on cause of tinnitus, degree and type of hearing loss were not taken into consideration for the purpose of this study. None of the participants had any observed psychological or neurological disturbances. All participants were native Tamil speakers and were fluent in reading Tamil script. Participants were from ENT and audiology clinics in and around the city of Chennai in Tamil Nadu.

Administration of the THI-Tamil

The participants were informed that the questionnaires were being administered for the purpose of research, and verbal consent was obtained. They were briefed about the questionnaire and the response options. Instructions were given to read the inventory and mark the answers for each item. Any clarification requested for by the participant was provided.

Validity of THI-Tamil

Sixty participants described above responded to both THI-English and THI-Tamil. The two versions were handed to the participant one after another and the order was randomised to account for carry-over and order effect. The following analyses were carried out: (a) construct validity using Kendall’s tau_b correlation; (b) concurrent validity using Cronbach’s alpha; and (c) internal consistency using Cronbach’s alpha.

Table 2. Agreement between raters (inter-rater reliability) using Fleiss’ Kappa.

<table>
<thead>
<tr>
<th>Rater</th>
<th>N items</th>
<th>Average % agreement between 3 raters</th>
<th>Pair wise % agreement between 1 &amp; 2</th>
<th>Pair wise % agreement between 1 &amp; 3</th>
<th>Fleiss’ Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>25</td>
<td>86.667%</td>
<td>84%</td>
<td>88%</td>
<td>0.867</td>
</tr>
</tbody>
</table>

Reliability of THI-Tamil

THI-Tamil was administered twice on 40 participants described above. The first administration was done as soon as they entered the clinic, and the retest was done just before they left the clinic. The minimum time gap between the two administrations was one hour.

Results and Discussion

Mean and standard deviation of total THI-Tamil and the individual subscales, was obtained on 40 participants. The means and standard deviations were 24.7 ± 17.5 for Total THI-Tamil, 11.5 ± 7.3 for the functional subscale, 8.2 ± 7.2 for the emotional subscale and 4.9 ± 4.3 for the catastrophic subscale. These results suggest that among the three subscales, the functional subscale was more affected in this group of participants. Similar results have been reported among participants of English, Danish and Italian translations, suggesting that tinnitus may be causing more impediments in functional domains.

Validity of THI-Tamil

Construct validity: In order to establish construct validity, the total score on each subscale (i.e. Functional, Emotional and Catastrophic) was correlated with all other subscales and also with the total THI-Tamil score. Results of correlation obtained using Kendall’s tau_b test of correlation ‘r’ are shown in Table 3. Correlation was found to be significant (p=0.000) across all three subscales and with the total THI-Tamil score. All three subscales were found to have statistically significant correlations with the total THI-Tamil, where the ‘r’ value was 0.658 for functional, 0.729 for emotional, and 0.616 for catastrophic. This revealed that the subscales consistently measure the attributes they intend to measure.

The correlation between the Functional and Catastrophic subscales was significantly low (r=0.313,
Table 3. Kendall’s tau_b Correlation matrix across subscales and total for THI-Tamil.

<table>
<thead>
<tr>
<th>Kendall’s tau_b</th>
<th>Subscales</th>
<th>Functional</th>
<th>Emotional</th>
<th>Catastrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=60</td>
<td>Functional</td>
<td>1.00</td>
<td>0.411*</td>
<td>0.313*</td>
</tr>
<tr>
<td></td>
<td>Emotional</td>
<td>0.411*</td>
<td>1.00</td>
<td>0.523*</td>
</tr>
<tr>
<td></td>
<td>Catastrophic</td>
<td>0.313*</td>
<td>0.523*</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>0.658*</td>
<td>0.729*</td>
<td>0.616*</td>
</tr>
</tbody>
</table>

* Correlation is significant at 0.01 level (2-tailed)

p=0.008), which suggests that the subscales do not have much overlap. Moderate but significant correlations between the Emotional-Function (r=0.411, p=0.000) and Emotional-Catastrophic (r=0.523, p=0.000) subscales indicate some overlap of items. Newman et al. (1996), in the THI-English also reported such results. Baguely and Andersson (2003) pointed out, based on factor analysis of the THI-English, the unifactorial structure of the scale, with a majority of items focusing on one single factor. Items such as: “Does your tinnitus make you feel confused?” from the functional subscale, “Because of your tinnitus, do you feel desperate?” from the catastrophic subscale, and “Because of your tinnitus, do you feel frustrated?” from the emotional subscale, all measure mental function of emotions as per International classification of Functioning, Disability, and Health, 2001 (Vidya & Rangasayee, 2010). Thus, the moderate correlations between subscales obtained in the present study may be attributed to such overlap in the structure of the scale.

Table 4. Item-wise correlation between THI-Tamil and THI-English.

<table>
<thead>
<tr>
<th>Item</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>F5</th>
<th>F6</th>
<th>F7</th>
<th>F8</th>
<th>F9</th>
<th>E10</th>
<th>C11</th>
<th>C12</th>
<th>C13</th>
<th>C14</th>
<th>C15</th>
<th>C16</th>
<th>C17</th>
<th>C18</th>
<th>C19</th>
<th>C20</th>
<th>E21</th>
<th>E22</th>
<th>E23</th>
<th>E24</th>
<th>E25</th>
</tr>
</thead>
<tbody>
<tr>
<td>α</td>
<td>0.92</td>
<td>0.88</td>
<td>0.80</td>
<td>0.78</td>
<td>0.61</td>
<td>0.91</td>
<td>0.82</td>
<td>0.85</td>
<td>0.74</td>
<td>0.87</td>
<td>0.86</td>
<td>0.85</td>
<td>0.86</td>
<td>0.80</td>
<td>0.59</td>
<td>0.95</td>
<td>0.49</td>
<td>0.97</td>
<td>0.62</td>
<td>0.81</td>
<td>0.78</td>
<td>0.90</td>
<td>0.92</td>
<td>0.79</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Concurrent validity: Correlations between each item of THI-English and THI-Tamil were calculated. The results are given in Table 4. The “α” value ranged from 0.49-0.97. As the least correlation between an item in THI-Tamil and THI-English was moderate (item no. F 17, α=0.49), a substantial relationship is indicated. The correlation between total scores on the THI-English version and the THI-Tamil version was found to be very high (α =0.96, p=0.006), indicating a dependable relationship. This finding suggests that the THI-Tamil has high concurrent validity.

Reliability of THI-Tamil

The internal consistency reliability coefficient (Cronbach’s alpha) was calculated for both the THI-Tamil total scale and the three sub-scales (Functional, Emotional and Catastrophic). Cronbach’s alpha was high for total THI-Tamil (0.98), Functional subscale (0.97), Emotional subscale (0.96) and Catastrophic subscale (0.93). Thus, THI-Tamil version was found to be reliable. In the present study, the minimum time gap between test and retest was 1 hour. Since this time gap was short, it may have had some influence on the internal consistency measure. However, the time gap could not be controlled as it depended on the participant’s compliance. Demorest and Walden (1984) reported in their study on psychometric principles in the selection, interpretation, and evaluation of communication self-assessment inventories, that the retest interval in the field cannot be carefully controlled, and the resulting correlations may only provide conservative estimates of retest reliability.

Conclusion

Tinnitus complaint does not consist of one single domain. Although the items on the THI are under three subscales, namely, functional, emotional, and catastrophic, moderate correlation between some subscales of the THI-Tamil indicates redundancy in a few of the items. As similar findings are reported in the THI-English and other translated versions, it may be worthwhile to consider revision of the tool. Also, such limitations may be overcome by using the multi-dimensional universal ICF framework. Further, it may be worthwhile to develop THI norms for an Indian clinical population to understand the domains that are affected. Overall, the THI-Tamil has high internal consistency, high construct validity, and concurrent validity. Thus, it is a reliable and valid tool to assess tinnitus-related handicap in Tamil-speaking adults.

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