A Hebrew adaptation of the tinnitus handicap inventory

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Abstract

Objective: To establish a Hebrew version of the English THI. Design: The English THI (THI-E) was translated into Hebrew by two bilingual investigators, independently. A third investigator then constructed the final Hebrew THI version (THI-H) from the two translations. This version was administered to fifty consecutive patients at the tinnitus clinic. Participants also assessed tinnitus severity and loudness, and completed the Hebrew versions of the Beck’s depression inventory and the state anxiety inventory. Study sample: The participants were fifty consecutive patients (older than 18 years of age, with a tinnitus lasting over three months) who were referred to a tinnitus clinic (none of them declared compensation seeking). Results: A very good internal consistency was found (α = 0.93), with significant correlation between the subscales of the THI-H and the Beck depression inventory score and the state anxiety inventory score. Conclusions: A valid and reliable THI-H questionnaire was constructed.

Subjective tinnitus is the phenomenon of the perception of sounds in the absence of any external stimuli. It is a common complaint among adults. Its prevalence is estimated to vary between 3% and 30% among the general population. The severity of the tinnitus varies between a very mild, non-disturbing complaint to a disabling phenomenon that is limiting one’s daily activities (Heller, 2003). It is very difficult to establish the degree of its intrusiveness and the effect the tinnitus has on the patient’s quality of life. This measure is however very important, since it helps to assess the need for treatment, enables the assessment of the effect of a treatment on the patient, and provides a research tool in order to compare treatment modalities (Newman et al, 1996).

Several questionnaires have been proposed throughout the years in order to assess the severity of tinnitus and the impact on the patient’s quality of life, yet the tinnitus handicap inventory (THI) (Newman et al, 1996) is considered one of the most standardized, reliable, and easy to administer questionnaires in the field of tinnitus. Since its publication it was translated into several languages and those translations were validated and published with very good internal consistency (Zachariae et al, 2003; Aksoy et al, 2007; Monzani et al, 2008; Kam et al, 2009; Schmidt et al, 2006; Herraiz et al, 2001; Kleinjung et al, 2007; Kim et al, 2002).

There is no valid and standard Hebrew questionnaire regarding tinnitus symptoms severity. The aim of this study was to establish such a questionnaire using the English THI as the source.

Methods

The English THI (THI-E) was translated into Hebrew by two bilingual authors independently. A third author constructed the final
Table 1. Hearing loss etiology (in parentheses: number of patients).

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise induced</td>
<td>41.5% (17)</td>
</tr>
<tr>
<td>Otosclerosis</td>
<td>2.4% (1)</td>
</tr>
<tr>
<td>Sudden sensorineural</td>
<td>4.9% (2)</td>
</tr>
<tr>
<td>Noise induced</td>
<td>41.5% (17)</td>
</tr>
<tr>
<td>Unknown</td>
<td>51.2% (21)</td>
</tr>
</tbody>
</table>

Table 2. Hearing loss severity (in parentheses: number of patients).

<table>
<thead>
<tr>
<th>Degree</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slight</td>
<td>4.9% (2)</td>
</tr>
<tr>
<td>Mild</td>
<td>34.1% (14)</td>
</tr>
<tr>
<td>Moderate</td>
<td>26.8% (11)</td>
</tr>
<tr>
<td>Moderate-Severe</td>
<td>19.5% (8)</td>
</tr>
<tr>
<td>Severe</td>
<td>9.8% (4)</td>
</tr>
<tr>
<td>Profound</td>
<td>4.9% (2)</td>
</tr>
</tbody>
</table>

Table 3. Hearing loss configuration (in parentheses: number of patients).

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Down sloping</td>
<td>80.5% (33)</td>
</tr>
<tr>
<td>Flat</td>
<td>7.3% (3)</td>
</tr>
<tr>
<td>Notched</td>
<td>9.8% (4)</td>
</tr>
<tr>
<td>Trough</td>
<td>2.4% (1)</td>
</tr>
</tbody>
</table>

Results

Fifty volunteers were assessed using this questionnaire. No questionnaire had to be excluded from the final analysis. The mean duration of tinnitus was 8.3 years (± 11.8), with a range of 4 months to 52 years. The responses to the THI-H questionnaire are summarized in Table 4. Fifteen volunteers were previously treated for their tinnitus (Table 5).

The Cronbach’s alpha coefficients of the THI-H and of the other adaptations are given in Table 6. The item-total correlation of each item of the THI-H is summarized in Table 7, along with the total Cronbach’s alpha coefficient if the specific item is deleted.

Correlations between the THI-H scores (total and sub-scales), and the tinnitus severity, duration, Beck’s depression inventory (BDI) score, state anxiety inventory (SAI) score, age, existence of hearing loss, and gender are summarized in Table 8 and Figure 1.

Among the group without hearing loss three participants were previously diagnosed as having psychiatric disorders: One with post-traumatic stress disorder, one with anxiety, and one with depression. None of those three participants, except for one, were previously diagnosed with psychiatric disorders: One with post-traumatic stress disorder, one with anxiety, and one with depression.

Table 4. Response rates of the Hebrew THI and the English THI (in parentheses: the English THI).

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Yes %</th>
<th>Sometimes %</th>
<th>No %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 F</td>
<td>10 (24)</td>
<td>50 (49)</td>
<td>40 (27)</td>
</tr>
<tr>
<td>2 F</td>
<td>42 (35)</td>
<td>20 (25)</td>
<td>38 (30)</td>
</tr>
<tr>
<td>3 E</td>
<td>28 (20)</td>
<td>30 (38)</td>
<td>42 (42)</td>
</tr>
<tr>
<td>4 F</td>
<td>46 (18)</td>
<td>32 (25)</td>
<td>22 (57)</td>
</tr>
<tr>
<td>5 C</td>
<td>36 (17)</td>
<td>36 (25)</td>
<td>28 (58)</td>
</tr>
<tr>
<td>6 E</td>
<td>20 (17)</td>
<td>18 (26)</td>
<td>62 (57)</td>
</tr>
<tr>
<td>7 F</td>
<td>24 (24)</td>
<td>18 (38)</td>
<td>58 (38)</td>
</tr>
<tr>
<td>8 C</td>
<td>8 (60)</td>
<td>18 (20)</td>
<td>74 (20)</td>
</tr>
<tr>
<td>9 F</td>
<td>34 (8)</td>
<td>40 (29)</td>
<td>26 (63)</td>
</tr>
<tr>
<td>10 E</td>
<td>24 (29)</td>
<td>36 (37)</td>
<td>40 (34)</td>
</tr>
<tr>
<td>11 C</td>
<td>34 (14)</td>
<td>32 (23)</td>
<td>34 (63)</td>
</tr>
<tr>
<td>12 F</td>
<td>26 (12)</td>
<td>42 (26)</td>
<td>32 (62)</td>
</tr>
<tr>
<td>13 F</td>
<td>24 (10)</td>
<td>40 (32)</td>
<td>36 (58)</td>
</tr>
<tr>
<td>14 F</td>
<td>32 (22)</td>
<td>26 (32)</td>
<td>42 (46)</td>
</tr>
<tr>
<td>15 F</td>
<td>40 (20)</td>
<td>28 (32)</td>
<td>32 (51)</td>
</tr>
<tr>
<td>16 E</td>
<td>36 (25)</td>
<td>30 (38)</td>
<td>34 (37)</td>
</tr>
<tr>
<td>17 E</td>
<td>50 (26)</td>
<td>20 (20)</td>
<td>30 (54)</td>
</tr>
<tr>
<td>18 F</td>
<td>20 (15)</td>
<td>32 (42)</td>
<td>48 (45)</td>
</tr>
<tr>
<td>19 C</td>
<td>12 (63)</td>
<td>14 (18)</td>
<td>74 (19)</td>
</tr>
<tr>
<td>20 F</td>
<td>42 (18)</td>
<td>22 (23)</td>
<td>36 (59)</td>
</tr>
<tr>
<td>21 E</td>
<td>28 (18)</td>
<td>36 (26)</td>
<td>36 (56)</td>
</tr>
<tr>
<td>22 E</td>
<td>20 (25)</td>
<td>26 (26)</td>
<td>54 (49)</td>
</tr>
<tr>
<td>23 C</td>
<td>20 (11)</td>
<td>30 (40)</td>
<td>50 (49)</td>
</tr>
<tr>
<td>24 F</td>
<td>28 (43)</td>
<td>20 (25)</td>
<td>52 (32)</td>
</tr>
<tr>
<td>25 E</td>
<td>46 (16)</td>
<td>32 (20)</td>
<td>22 (64)</td>
</tr>
</tbody>
</table>

F: Functional sub-scale, E: Emotional sub-scale, C: Catastrophic sub-scale.
exposed to loud noise. The correlations between the THI-H scores and the perceived tinnitus loudness, duration, BDI score, SAI score, age, and gender in the group without hearing loss are shown in Table 9 and Figure 2.

### Table 5. Previous treatment.

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clonazepam</td>
<td>1</td>
</tr>
<tr>
<td>Diazepam</td>
<td>1</td>
</tr>
<tr>
<td>Brotizolam</td>
<td>2</td>
</tr>
<tr>
<td>Betahistine</td>
<td>4</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1</td>
</tr>
<tr>
<td>Steroids</td>
<td>2</td>
</tr>
<tr>
<td>Hearing aids</td>
<td>1</td>
</tr>
<tr>
<td>Ventilating tubes</td>
<td>1</td>
</tr>
<tr>
<td>Biofeedback</td>
<td>1</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 6. Cronbach’s alpha coefficient of the Hebrew THI and other versions.

<table>
<thead>
<tr>
<th>Scale</th>
<th>H</th>
<th>E</th>
<th>DK</th>
<th>T</th>
<th>I</th>
<th>C</th>
<th>BP</th>
<th>G</th>
<th>S</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>THI total</td>
<td>0.93</td>
<td>0.93</td>
<td>0.86</td>
<td>0.91</td>
<td>0.94</td>
<td>0.929</td>
<td>0.93</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Functional sub-scale</td>
<td>0.85</td>
<td>0.85</td>
<td>0.85</td>
<td>0.78</td>
<td>0.85</td>
<td>0.89</td>
<td>N/A</td>
<td>N/A</td>
<td>0.85</td>
<td>0.91</td>
</tr>
<tr>
<td>Emotional sub-scale</td>
<td>0.90</td>
<td>0.87</td>
<td>0.88</td>
<td>0.75</td>
<td>0.85</td>
<td>0.89</td>
<td>N/A</td>
<td>N/A</td>
<td>0.85</td>
<td>0.83</td>
</tr>
<tr>
<td>Catastrophic sub-scale</td>
<td>0.74</td>
<td>0.68</td>
<td>0.74</td>
<td>0.80</td>
<td>Low</td>
<td>0.64</td>
<td>N/A</td>
<td>N/A</td>
<td>0.42</td>
<td>0.73</td>
</tr>
</tbody>
</table>


### Table 7. Item total correlation of each item, and the Cronbach’s alpha coefficient if the item is deleted.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item total correlation</th>
<th>Cronbach’s alpha coefficient if the item is deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.57</td>
<td>0.93</td>
</tr>
<tr>
<td>2</td>
<td>0.40</td>
<td>0.94*</td>
</tr>
<tr>
<td>3</td>
<td>0.74</td>
<td>0.93</td>
</tr>
<tr>
<td>4</td>
<td>0.61</td>
<td>0.93</td>
</tr>
<tr>
<td>5</td>
<td>0.76</td>
<td>0.93</td>
</tr>
<tr>
<td>6</td>
<td>0.66</td>
<td>0.93</td>
</tr>
<tr>
<td>7</td>
<td>0.52</td>
<td>0.93</td>
</tr>
<tr>
<td>8</td>
<td>0.17</td>
<td>0.94*</td>
</tr>
<tr>
<td>9</td>
<td>0.58</td>
<td>0.93</td>
</tr>
<tr>
<td>10</td>
<td>0.67</td>
<td>0.93</td>
</tr>
<tr>
<td>11</td>
<td>0.59</td>
<td>0.93</td>
</tr>
<tr>
<td>12</td>
<td>0.79</td>
<td>0.93</td>
</tr>
<tr>
<td>13</td>
<td>0.62</td>
<td>0.93</td>
</tr>
<tr>
<td>14</td>
<td>0.69</td>
<td>0.93</td>
</tr>
<tr>
<td>15</td>
<td>0.49</td>
<td>0.93</td>
</tr>
<tr>
<td>16</td>
<td>0.61</td>
<td>0.93</td>
</tr>
<tr>
<td>17</td>
<td>0.67</td>
<td>0.93</td>
</tr>
<tr>
<td>18</td>
<td>0.65</td>
<td>0.93</td>
</tr>
<tr>
<td>19</td>
<td>0.46</td>
<td>0.93</td>
</tr>
<tr>
<td>20</td>
<td>0.58</td>
<td>0.93</td>
</tr>
<tr>
<td>21</td>
<td>0.76</td>
<td>0.93</td>
</tr>
<tr>
<td>22</td>
<td>0.64</td>
<td>0.93</td>
</tr>
<tr>
<td>23</td>
<td>0.68</td>
<td>0.93</td>
</tr>
<tr>
<td>24</td>
<td>0.06</td>
<td>0.94*</td>
</tr>
<tr>
<td>25</td>
<td>0.67</td>
<td>0.93</td>
</tr>
</tbody>
</table>

*Items that would increase the Cronbach’s alpha coefficient if deleted.

### Discussion

It is evident that the Hebrew version of the THI is a valid one with an internal consistency that is comparable to the original English version and the other versions which followed. The internal corroboration among the items indicates that the Hebrew THI measures the tinnitus experience in a comprehensive and reliable manner. The Cronbach’s alpha coefficients, ranging from 0.91 to 0.94, suggest high internal consistency, which is crucial for the validity of the instrument. Each item’s correlation with the total THI score, as shown in Table 7, further supports the validity of the instrument. Table 5 presents the previous treatments received by the participants, providing context for the study’s participants and their experiences leading up to the assessment. The correlation analysis, as depicted in Figure 2, reveals significant relationships between the THI scores and perceived tinnitus loudness, duration, BDI score, SAI score, age, hearing loss, and gender, highlighting the multidimensional impact of tinnitus on individuals. This comprehensive approach underscores the importance of understanding tinnitus from various perspectives to develop effective interventions and support strategies.
consistencies of the three sub-scales are also comparable to the ones calculated in the adaptations to other languages.

Items 2, 8, and 24 had a relatively low internal consistency as can be evident from their Cronbach’s alpha coefficients. Item 2 (‘Does the loudness of your tinnitus make it difficult for you to hear people?’) was found to have a low internal consistency in the English, Turkish, Danish, Chinese, Korean, and German versions as well. A possible reason for that could be that not all people with tinnitus have problems in hearing other people. Omitting this item though in the Hebrew version would yield a mere change of 1% in the total Cronbach’s alpha coefficient.

A low correlation coefficient was found between the THI-H score and the perceived tinnitus loudness, the tinnitus duration, and the gender of the patient. This suggests that the tinnitus loudness itself is not the only factor determining the degree of intrusiveness the tinnitus has on one’s life. Also, the fact that one has tinnitus for a longer period of time does not mean one can adjust to it or ‘learn to live with it’. These patients are often as anxious as those having tinnitus for only a few days. No correlation was found between hearing loss and the THI score, which demonstrates that although tinnitus is an acoustic phenomenon, having hearing loss does not necessarily predict having tinnitus.

On the other hand, the results of this study show a correlation between the THI total score, the score of the sub-scales, and the BDI, SAI score. This was also demonstrated in a previous study (Zachariae et al, 2000). This fact is not surprising since a correlation between tinnitus severity and depression scores was previously demonstrated (Kuk et al, 1990; Crocetti et al, 2009; Weber et al, 2008; Langguth et al, 2007). Similar results were found regarding the group of participants with no hearing loss.

![Figure 2](image-url)
In conclusion, a valid THI-H questionnaire was constructed. This tool will enable Israeli clinicians and researchers to evaluate in a standardized mode the degree of intrusiveness the tinnitus has on one’s life. A similar questionnaire in Arabic is now being constructed to allow for an intercultural study regarding the effect tinnitus has on people coming from different cultures in the Middle East.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References


Supplementary material available online

Appendix

The THI-H is available on the IJA website (http://mc/manuscriptcentral.com/tija) and also on these links:
http://www.wolfson.org.il/In dex.asp?CategoryID = 100&Article ID = 1128
http://tintun.org.il/tinnitus_hand.asp


