The Validity and Reliability of Tinnitus Handicap Inventory Thai Version

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Objective: *Demonstrate the reliability and validity of the Tinnitus Handicap Inventory Thai Version (THI-T), a self-report measure of tinnitus.*
Material and Method: *A cross-sectional psychometric validation study was used to determine internal consistency reliability and validity of the Tinnitus Handicap Inventory Thai Version at the Otoneurology clinic at Tertiary care center. The cross-cultural adaptation of the Tinnitus Handicapped Inventory English version (Newman et al, 1996) was translated into Thai version following the steps indicated by Guillemin et al. The reliability was constructed by using Cronbach's coefficient alpha. The validity was analyzed by the correlation between Tinnitus Handicap Inventory Thai version and the 36-items short form health survey and visual analog scale using Spearman and Pearson test.*
Results: *The result showed good internal consistency reliabilities of total, functional, emotional, and catastrophic scale (α = 0.902, 0.804, 0.831 and 0.661, respectively) of Tinnitus Handicap Inventory Thai Version. Spearman correlation showed the significant correlation of Tinnitus Handicap Inventory to 36-items short form health survey and visual analog scale.*
Conclusion: *Tinnitus Handicap Inventory Thai Version will be a vigorous tool in evaluating tinnitus patients as well as monitoring the progress of their symptoms.*

Keywords: *Tinnitus handicap inventory, Tinnitus, THI, Thai version*

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Tinnitus is an unfavorable noise, the phantom auditory perception in absence of external stimuli[1]. It can be categorized into subjective and objective tinnitus. Objective tinnitus can be heard by the examiner and the majority of pathology can be identified[2], such as from myoclonus or pulsatile tinnitus. On the contrary, subjective tinnitus is usually audible only by the patients and the majority of this type admits that it disturbs their daily lives.

The epidemiology of tinnitus is about three to 30%, depending on population and definition of tinnitus[3]. According to Multicenter National study in United Kingdom, 15% of adult population has tinnitus[2], whereas 32% of USA adult population from the study of the National Center of Health Statistics has the symptom[4]. It seems likely to intensify as the age increases. The treatment has been established such as hearing aids, noise generator, pharmacotherapy, acupuncture, transcutaneous electrical stimulation, or tinnitus retraining therapy, etc.

The instrument for measurement of the outcome of the treatment is limited because of the subjectivity of disturbance. The Tinnitus Handicap Inventory (THI) was developed for a self-report tinnitus handicapped measure by Craig W Newman et al[5]. THI is a 25-items questionnaire, which is composed of three subscales; a functional subscale (12 items), an emotional subscale (8 items), and a catastrophic response subscale (5 items), that evaluate role and physical functioning, psychological distress as well as desperation and loss of control[5,6]. Each item contains answer with "yes = 4 points", "sometimes = 2 points" and "no = 0 point". The range of score is 0 to 100, which is divided into non handicapped (0-16), mild handicapped (18-36), moderate handicapped (38-56), severe handicapped (58-76), and catastrophic handicapped (78-100)[7].

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THI has been translated from English version into many languages such as Cantonese[8], French[9], Danish[10], Italian[6], and Hebrew[11]. All of the versions showed excellent internal consistency, validity, and reliability. For this reason, THI is a vigorous and effective tool to measure the impact of tinnitus on daily life. Many Thai patients with tinnitus attended our clinic. Up until now, there has been no tool to evaluate the severity of tinnitus and treatment outcome for patients in Thailand. Unfortunately, the THI is in English, which Thai native speakers in general do not understand. According to this reason, the authors would like to conduct observation on the validation and reliability of Thai version of THI (THI-T).

Material and Method

The research has been approved by institutional review board of the Faculty of Medicine, Siriraj Hospital, Mahidol University.

Development of the Thai version of THI (THI-T)

The author of the original English version THI (THI-E) has given us permission to translate and validate the questionnaire into Thai language. Then the authors used the guideline for the process of cross-cultural adaptation of self-report measure following the steps indicated by Guillemin et al (1993)[12,13].

Stage I: Initial translation

The translation of THI-E into Thai language was conducted by two independent otoneurologists who are fluent in both English and Thai.

Stage II: Synthesis

Two otoneurologists made the consensus and synthesis of the first THI-T.

Stage III: Back translation

Afterwards, two independent bilingual translators with English mother tongue produced the back translation from THI-T to THI-E in order to establish the semantic equivalence.

Stage IV: The expert committee

The medical associate review of THI-T was conducted to resolve the ambiguous words and to establish the pre-final THI-T in order to consolidate the semantic, idiomatic, experiential, and conceptual equivalence.

Stage V: Test of the pre-final version

A representative sample of 20 layperson volunteers answered in the pre-final version test to check for clarity and error of the questionnaires. This resulted in the final version of THI-T. THI-T is shown in appendix.

Subjects

Sixty-six participants with symptoms of tinnitus at the Otoneurology clinic, Siriraj Hospital, Mahidol University were recruited. The participation criteria were patients who were aged above 18 years old, had tinnitus for more than six months, and were good reading and speaking Thai. The subjects' ages ranged from 28 to 80 years (mean 56.7 ± 10.9 years) with duration of tinnitus from six to 396 months (mean 57.3 ± 86.1 months). The characteristics of tinnitus were high pitch noise (69.7%) and low pitch noise (30.3%). Patients suffered from bilateral and unilateral tinnitus were about 18.2% and 81.8% (right 37.9%, left 43.9%), respectively. The absolute tone average was 32 ± 26 dB.

Data collection

Data collection was conducted between August 2009 and December 2010. Patients were asked to complete THI-T and the 36-Item Short Form Health Survey (SF-36) Thai version[14] approved by standardization of validation and reliability as the English version. SF-36 consists of 36 items classified into eight subscales: general health (GH), physical functioning, role-physical, bodily pain (BP), vitality (V), role-emotional (RE), and mental health (MH).

Furthermore, they also completed visual analog scale (VAS), which was designed as the 100-mm lines with scale 0 and 100 at the endpoints, which the patients were to evaluate their tinnitus by drawing a line on the VAS scale. The tinnitus was evaluated in the aspect of tinnitus loudness, tinnitus annoyance, sleeping annoyance, concentration annoyance, communication annoyance, affection of emotion, and fear of malignancy.

Statistical analysis

Analysis of internal consistency reliability of item-total correlation and three subscales, Cronbach's Coefficient Alpha was calculated, where values > 0.70 indicate a satisfactory internal consistency.

Analysis of validity was evaluated by examining the correlation between THI-T score, SF-36 Thai version score; and VAS score with Spearman and

Pearson correlation test. A p-value of less than 0.05 set for statically significant.

Results

The average summary of THI-T in each subscales were functional subscale 15.6 ± 9.4, emotional subscale 10.7 ± 7.3, catastrophic subscale 10.9 ± 4.7, and total scale 37.2 ± 19 as shown in Table 1. Additionally, the severity of tinnitus was classified into none (score 0-16) 10.6%, mild (score 18-36) 42.2%, moderate (score 38-56) 28.8%, and severe handicapped (score > 56) 18.2%

Internal consistency reliability

The internal consistency reliability coefficients of THI-T were calculated by using Cronbach's alpha and the item-total correlation. Cronbach's alpha for total scale was 0.902, which demonstrated a high degree of the internal consistency. The Cronbach's alpha for functional, emotional, and catastrophic scale were 0.804, 0.831, and 0.661, respectively (Table 1). The item-total correlations ranged from 0.37 (7F; In regard to tinnitus, do you have trouble falling asleep at night?) to 0.86 (10E; In regard to tinnitus, do you feel frustrated?), as shown in the Table 2. Pearson product-moment correlation coefficient between THI-T total score and each subscale score showed medium to strong correlation ($r = 0.520$-0.934; $p < 0.001$), the result is presented in Table 3.

Constructed validity

The constructed validity of THI-T was analyzed by its correlations with the VAS on subjective rating and SF-36. The present study demonstrated medium to strong correlation between VAS of self-report and total as well as the subscales of THI-T as shown in Table 4. On the other hand, the significant correlation was found between THI-T and SF-36 with SF, MH, VT and GH as presented in Table 5.

Discussion

The result of this observation demonstrated good internal consistency of total scale ($\alpha = 0.902$), which was nearly the same as the English version ($\alpha = 0.93$)[7], Cantonese version ($\alpha = 0.94$)[8], Danish version ($\alpha = 0.93$)[10], Italian version ($\alpha = 0.91$)[15], or Hebrew version ($\alpha = 0.93$)[11]. The internal reliabilities of functional, emotional, and catastrophic response subscales were 0.804, 0.831, and 0.661, respectively. The catastrophic subscale did not provide a good result, possibly due to inadequate number of questions (5 items). Nevertheless, comparing to the original version, the total outcome was similar (Table 1).

The correlation between THI-T and VAS (Table 4) showed medium to strong correlation in almost all subscales except for sleeping annoyance, which presented small effect of tinnitus.

The validity of THI-T using the correlation of SF-36 is shown in Table 5. Significant correlation between THI-T and SF-36 was found in the SF, GH, VT, and GH. Still there was no correlation of PF, RP, RE, and BP, as these subscales reflects the problems of body in terms of activities, work, and daily life, irrelevant to tinnitus. The catastrophic subscale was the least applicable to SF-36, which was the same as the THI Cantonese version and Italian version.

According to the correlation between THI-T and age, duration of tinnitus, and hearing threshold, there was only a significant correlation between catastrophic subscale and age ($r = 0.26$)(Table 6). This may imply that the older the patients are, the more they concern. Moreover, it suggested that the duration of tinnitus and the average hearing threshold did not determine the annoyance of one person's tinnitus.

Conclusion

The present study demonstrated that THI-T is reliable and valid as much as the English version in evaluation of patients with tinnitus and the outcome assessment of the treatment.

Table 1. Mean score and Cronbach's alpha of THI-T and THI-E

	Total	Functional	Emotional	Catastrophic
Mean ± SD				
THI-T	37.2 ± 19.0	15.6 ± 9.4	10.7 ± 7.3	10.9 ± 4.7
THI-E	25.4 ± 20.5	11.0 ± 9.7	8.2 ± 8.4	6.1 ± 4.5
THI-T Cronbach's alpha	0.902	0.804	0.831	0.661
THI-E Cronbach's alpha	0.93	0.86	0.87	0.68

THI Thai version (THI-T), THI English version (THI-E)

Table 2. Mean, standard deviation and item-total correlations for each THI-T item

Scale	Items	Question	Mean	SD	Item-total correlation
F	1	Because of your tinnitus, it is difficult for you to concentrate?	2.0	1.3	0.45
F	2	Does the loudness of your tinnitus make it difficult to hear people?	1.9	1.4	0.41
E	3	Does your tinnitus make you angry?	1.1	1.3	0.65
F	4	Does your tinnitus make you feel confused?	1.6	1.5	0.58
C	5	Because of your tinnitus, do you feel desperate?	0.7	1.2	0.61
E	6	Do you complain a great deal about your tinnitus?	1.9	1.4	0.58
F	7	Because of your tinnitus, do you have trouble falling asleep at night?	1.3	1.4	0.37
C	8	Do you feel as though you cannot escape your tinnitus	3.3	1.2	0.39
F	9	Does your tinnitus interfere with your ability to enjoythe social activities (dinner, movies)?	1.0	1.5	0.43
E	10	Because of your tinnitus, do you feel frustrated?	1.6	1.5	0.86
C	11	Because of your tinnitus, do you feel that you have a terrible disease?	1.5	1.6	0.54
F	12	Does your tinnitus make it difficult for you to enjoy life?	1.4	1.5	0.76
F	13	Does your tinnitus interfere with your job or household responsibilities?	0.6	1.2	0.53
F	14	Because of your tinnitus, do you find that you are often irritable?	1.2	1.3	0.71
F	15	Because of your tinnitus, is it difficult for you to read?	0.5	1.1	0.39
E	16	Does your tinnitus make you upset?	1.2	1.2	0.71
E	17	Do you feel that your tinnitus has placed stress on your relationships?	0.8	1.2	0.51
F	18	Do you feel difficult to focus your attention away from your tinnitus and on other things?	1.5	1.5	0.65
C	19	Do you feel that you have no control over your tinnitus?	2.9	1.5	0.42
F	20	Because of your tinnitus, do you feel tired?	0.8	1.3	0.66
E	21	Because of your tinnitus, do you feel depressed?	0.8	1.2	0.59
E	22	Does your tinnitus make you feel anxious?	1.9	1.4	0.64
C	23	Do you feel that you can no longer cope with your tinnitus?	2.5	1.6	0.43
F	24	Does your tinnitus get worse when you are under stress?	1.9	1.7	0.39
E	25	Does your tinnitus make you feel insecure?	1.5	1.6	0.48

Table 3. Pearson product-moment correlation Coefficient between THI-T total and subscale scores

	Total	Functional	Emotional	Catastrophic
Total	1			
Functional	0.934**	1		
Emotional	0.924**	0.799**	1	
Catastrophic	0.726**	0.520**	0.569**	1

** Correlation is significant at the 0.01 level ($p < 0.01$)

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Potential conflicts of interest

None.

Abbreviation

THI: Tinnitus Handicap Inventory

Table 4. Correlation between score on THI-T and VAS

	Total	Functional	Emotional	Catastrophic
Tinnitus loudness	0.352**	0.305*	0.315**	0.318**
Tinnitus annoyance of daily life	0.480**	0.516**	0.399**	0.281*
Sleeping annoyance	0.211	0.123	0.269*	0.187
Concentration annoyance	0.484**	0.466**	0.447**	0.326**
Communication annoyance	0.442**	0.491**	0.352**	0.251*
Affection of emotion	0.513**	0.526**	0.461**	0.299*
Fear of malignancy	0.463**	0.288*	0.462**	0.573**

** Correlation is significant at the 0.01 level ($p < 0.01$), * Correlation is significant at the 0.05 level ($p < 0.05$)

Table 5. Correlation between score on THI-T and SF-36 sores

	Total	Functional	Emotional	Catastrophic
Physical Functioning (15)	-0.066	-0.115	-0.031	0.031
Role-physical (6)	-0.164	-0.182	-0.162	-0.045
Social functioning (SF)	-0.317**	-0.350**	-0.274*	-0.149
Role-emotional (RE)	-0.087	-0.089	-0.154	0.069
Bodily pain (BP)	-0.211	-0.242	-0.242	0.010
General Mental health (MH)	-0.650**	-0.637**	-0.603**	-0.409**
Vitality (VT)	-0.470**	-0.491**	-0.452**	-0.209
General Health perception (GH)	-0.439**	-0.442**	-0.376**	-0.298*

** Correlation is significant at the 0.01 level ($p < 0.01$), * Correlation is significant at the 0.05 level ($p < 0.05$)

Table 6. Spearman correlation between THI-T and age, duration of tinnitus and average hearing threshold

THI-T	Total	Functional	Emotional	Catastrophic
Age	-0.149	-0.057	-0.135	-0.260*
Duration of tinnitus	-0.132	-0.127	-0.165	-0.075
Average hearing threshold	0.109	0.197	0.014	0.002

* Correlation is significant at the 0.05 level ($p < 0.05$)

THI-E: Tinnitus Handicap Inventory English version
THI-T: Tinnitus Handicap Inventory Thai version
SF-36: 36-item short form health survey
GH: general healt
PF: physical functioning
RP: role-physical
BP: bodily pain
V: vitality
RE: role-emotional
MH: mental health
VAS: visual analog scale

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Appendix. Tinnitus Handicap Inventory Thai version

Questionnaire Date__/___/_____ Participant ID _____ Sex ___M____F

แบบสอบถาม Tinnitus Handicap Inventory ฉบับภาษาไทย
คำชี้แจงในการตอบแบบสอบถามแบบสอบถามนี้เป็นแบบสอบถามเกี่ยวกับเสียงรบกวนในหูที่มีผลต่อชีวิตประจำวัน คำถามในแบบสอบถามนี้เป็นตัวเลือก กรุณากาเครื่องหมาย (✕) ลงในช่อง ☐ ดังตัวอย่าง☒ โปรดกรุณาตอบทุกคำถาม หากท่านไม่แน่ใจให้เลือกคำตอบที่ท่านคิดว่าใกล้เคียงที่สุด

คำถาม	ใช่	บางครั้ง	ไม่
1F. เสียงรบกวนในหู ทำให้คุณยากที่จะรวมสมาธิหรือไม่?			
2F. เสียงรบกวนในหูดังจนทำให้คุณได้ยินเสียงคนอื่นๆได้ยากหรือไม่ ?			
3E. เสียงรบกวนในหูทำให้คุณโกรธหรือไม่ ?			
4F. เสียงรบกวนในหูทำให้คุณรู้สึกสับสนหรือไม่ ?			
5C. เสียงรบกวนในหูทำให้คุณรู้สึกสิ้นหวังหรือไม่ ?			
6E. คุณบ่นเรื่องเสียงรบกวนในหูมากหรือไม่ ?			
7F.เสียงรบกวนในหูทำให้คุณนอนหลับยากหรือไม่ ?			
8C.คุณรู้สึกว่าคุณไม่สามารถหลีกหนีจากเสียงรบกวนในหูได้ ?			
9F.เสียงรบกวนในหูรบกวนความสามารถของคุณที่จะทำกิจกรรมทางสังคม เช่น การออกไปรับประทานอาหารนอกบ้าน,การไปดูหนัง ฯลฯ หรือไม่ ?			
10E. เสียรบกวนในหูทำให้คุณรู้สึกว่าวุ่นใจหรือไม่ ?			
11C.เสียงรบกวนในหู ทำให้คุณรู้สึกว่าคุณมีโรคร้ายแรงหรือไม่ ?			
12F. เสียงรบกวนในหู ทำให้คุณรื่นรมย์กับชีวิตได้ยากขึ้นหรือไม่ ?			
13F. เสียงรบกวนในหูขัดขวางความรับผิดชอบในหน้าที่การงาน หรือการดูแลบ้านหรือไม่ ?			
14E. เสียงรบกวนในหูทำให้คุณรู้สึกโมโห,หงุดหงิดบ่อยหรือไม่ ?			
15F. เสียงรบกวนในหูทำให้คุณอ่านหนังสือได้ยากลำบากหรือไม่ ?			
16E. เสียงรบกวนในหูทำให้คุณอารมณ์เสียหรือไม่ ?			
17E. คุณรู้สึกว่าปัญหาเรื่องเสียงรบกวนในหู ทำให้ความสัมพันธ์ของคุณกับคนในครอบครัว และคุณกับเพื่อนๆตึงเครียดหรือไม่ ?			
18F. คุณพบว่ามันเป็นการยากลำบากที่จะเบนความสนใจไปจากเสียงรบกวนในหู และพุ่งความสนใจไปสู่สิ่งอื่นๆหรือไม่ ?			
19C. คุณรู้สึกว่าไม่สามารถควบคุมเสียงรบกวนในหูได้ ?			
20F. เสียงรบกวนในหูทำให้คุณรู้สึกเหนื่อยเหนื่อยหรือไม่ ?			
21E. เสียงรบกวนในหูทำให้คุณรู้สึกเศร้าซึมหดหู่หรือไม่ ?			
22E. เสียงรบกวนในหูทำให้คุณรู้สึกวิตกกังวลหรือไม่ ?			
23C. คุณรู้สึกว่าคุณไม่สามารถจัดการกับปัญหาเสียงรบกวนในหูได้อีกต่อไปหรือไม่ ?			
24F. เสียงรบกวนในหูเพิ่มมากขึ้นเมื่อคุณรู้สึกเครียดหรือไม่ ?			
25E. เสียงรบกวนในหูทำให้คุณรู้สึกไม่ปลอดภัยหรือไม่ ?			

การทดสอบคุณสมบัติของแบบสอบถาม Tinnitus handicap Inventory ฉบับภาษาไทย

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วัตถุประสงค์: *การศึกษานี้ทำขึ้นเพื่อเป็นทดสอบคุณสมบัติของแบบสอบถาม Tinnitus Handicap Inventory ฉบับภาษาไทยที่ได้รับการแปลจากต้นฉบับในภาษาอังกฤษซึ่งได้รับอนุญาตจากเจ้าของแบบสอบถามต้นฉบับ ในต่างประเทศแบบสอบถามนี้ใช้ประเมินตนเองของผู้ป่วยที่มีเสียงดังในหูเพื่อดูความรุนแรงของอาการเสียงดังในหู และประสิทธิผลของการรักษาที่ใช้กันแพร่หลายในต่างประเทศ พบว่าปัจจุบันในประเทศไทยยังไม่มีเครื่องมือที่ใช้ในการประเมินความรุนแรงและประสิทธิผลการรักษาของผู้ป่วยที่มีเสียงดังในหู*

วัสดุและวิธีการ: *ใช้วิธี cross-sectional psychometric validation study ทำการศึกษากับผู้ป่วยเสียงดังในหูที่ได้เข้ามารับการรักษาที่หน่วยโสตประสาทการได้ยินและการทรงตัว โรงพยาบาลศิริราช จำนวน 66 ราย ได้ทำแบบทดสอบ Tinnitus Handicap Inventory ฉบับภาษาไทยที่ได้รับการแปลกลับมา มีการทดสอบความเที่ยง โดยการใช้ Cronbach's coefficient alpha*

ผลการศึกษา: *พบว่าความเที่ยงภายในของ total, functional, emotional และ catastrophic scale (α = 0.902, 0.804, 0.831 และ 0.661 ตามลำดับ) มีความเที่ยงอย่างมีนัยสำคัญทางสถิติ นอกจากนี้ยังพบว่าความสัมพันธ์ของแบบสอบถาม Tinnitus handicap Inventory และแบบสอบถามคุณภาพชีวิต Short Form 36 รวมถึง visual analog scale มีความสัมพันธ์กันอย่างมีนัยสำคัญทางสถิติ*

สรุป: *แบบสอบถาม Tinnitus handicap Inventory ฉบับภาษาไทยมีความเที่ยงและความตรงส่วนใหญ่ใกล้เคียงกับแบบสอบถามต้นฉบับ*