

## Psychometric Properties of the Thai Herth Hope Index in Stroke Patients

Tantisuvanitchkul P, Thanakiatpinyo T and Kuptniratsaikul V  
Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital,  
Mahidol University, Bangkok, Thailand

### ABSTRACT

**Objectives:** To investigate the psychometric properties, both validity and reliability, of the Thai version of the Herth Hope Index (Thai HHI) in stroke patients.

**Study design:** Descriptive study.

**Setting:** Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand.

**Subjects:** Stroke patients attending the Department of Rehabilitation Medicine during December 2017 to August 2018.

**Methods:** After translation to Thai language and after assessing the Thai translation for content validity, 70 stroke patients were assessed by using the Thai HHI to determine construct validity and internal consistency. Forty of those same 70 patients were then reassessed one week later to determine test-retest reliability. Convergent and discriminant validity were assessed by evaluating the correlation between the Thai HHI and the Rosenberg Self-Esteem Scale (RSES) and the Patient Health Questionnaire (PHQ-9), respectively, by defining the Spearman's correlation coefficient.

**Results:** The Thai HHI showed good content validity (CVI = 0.98), moderate convergent validity ( $r = 0.563$ ), moderate discriminant validity ( $r = -0.545$ ), acceptable internal consistency (Cronbach's  $\alpha = 0.794$ ), and good test-retest reliability (ICC = 0.776).

**Conclusion:** The Thai HHI was found to have good to moderate psychometric properties as evidenced by good content validity, moderate construct validity, acceptable internal consistency, and good test-retest reliability. These findings suggest that the Thai HHI can be used to evaluate hope among Thai stroke patients.

**Keywords:** psychometric properties, validity, reliability, hope, stroke, Thai Herth Hope Index

*ASEAN J Rehabil Med. 2020; 30(1): 15-20.*

### Introduction

When a person experiences stress that is caused by negative emotions or illness, hope is a coping strategy that is often employed to help manage the problem or crisis.<sup>(1)</sup> Hope is a multidimensional force that is personally significant

and used for achieving goals and overcoming obstacles.<sup>(2)</sup> Moreover, hope is a thought process that almost all people use throughout their life, especially when they are facing illness and/or losses.<sup>(3)</sup> In patients with chronic illness, hope is a prerequisite to effective coping and decision-making, and it has a protective function against stress.<sup>(4)</sup> In this setting, stress is reduced because hope encourages the strength needed to solve problems and to face losses and suffering, and this improves quality of life.<sup>(5)</sup>

In a chronic illness setting, stroke is a major disease of concern among psychiatrists, because it was reported that approximately 30% of stroke patients developed depression – in both the subacute phase and the chronic phase.<sup>(6)</sup> Patients with severe disability tend to develop depression due to the high level of dependency caused by their condition.<sup>(7)</sup>

Although the mechanism is not yet clear, hope is believed to effectuate a positive effect on neurotransmission, which helps to promote neuro-recovery in stroke patients.<sup>(4)</sup> Moreover, hope was found to be one of the predictors of positive rehabilitation outcomes.<sup>(8)</sup> A previous study found that if patients had hope, they were more likely to overcome their stress and obstacles, which made them more likely to achieve better patient outcomes.<sup>(9)</sup> We hypothesized that more hope would positively influence better rehabilitation outcomes among stroke patients, so the authors aimed to identify a valid and reliable tool for evaluating hope so that association between hope and rehabilitation outcomes could be evaluated in our future study.

The Herth Hope Index (HHI) consisting of 12 items, was developed in 1992 from its predecessor (the Herth Hope Scale) with the objective of reducing the number and complexity of the questions, and to make it more precise and clinically usable. The HHI was found to have good psychometric properties,<sup>(5)</sup> and has been translated into many languages, including Chinese,<sup>(10)</sup> Portuguese,<sup>(11)</sup> German,<sup>(12)</sup> and Italian.<sup>(13)</sup>

A previous study translated the original version of the HHI into Thai language, but face validity and internal consistency

**Correspondence to:** Thanitta Thanakiatpinyo, MD, FRPhysiatrT; Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Wanglang Road, Bangkoknoi, Bangkok 10700, Thailand, E-mail: ththanitta@hotmail.com

Received: 11<sup>th</sup> December 2019

Revised: 15<sup>th</sup> January 2020

Accepted: 11<sup>th</sup> March 2020

were the only psychometric properties reported,<sup>(14)</sup> and this limited its clinical usefulness. Accordingly, the aim of this study was to translate the original version of the HHI to Thai language, and to evaluate its psychometric properties, including content validity, construct validity, internal consistency, and test-retest reliability, in Thai stroke patients with stroke onset of at least 3 months. This onset duration was chosen because it was reported that the disease reached its plateau for the recovery phase within 3 months,<sup>(15)</sup> at which point a more stable mood and level of hope were expected.

## Methods

The protocol for this study was approved by the Siriraj Institutional Review Board (SIRB) of the Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (COA no. 661/2560 [EC3]). This study complied with all of the principles set forth in the Declaration of Helsinki and all of its subsequent amendments, and all participating patients provided written informed consent to participate in this study.

### Translation

Prior to starting the translation process, we contacted Mrs. Alexander Kaye Herth to request a formal permission to translate her original copyrighted version of the HHI from English to Thai. After permission was granted, the HHI was translated into Thai language by linguistic experts from the Mahidol University Research Institute for Languages and Cultures of Asia (Appendix). After that translation step, the Thai language questions were then back-translated into English by different linguistic experts from Mahidol University in order to prevent/minimize bias. That back-translated English version was then sent to yet another expert whose mother tongue is English to compare it with the original English language version of the HHI.

### Participants

Inpatient and outpatient stroke patients, who were receiving treatment from the Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, met our inclusion criteria and were willing to participate, were eligible for recruitment. Patients aged > 18 years with onset of stroke  $\geq$  3 months and full consciousness were included. Those with cognitive impairment and/or an inability to communicate in Thai language were excluded. After written informed consent was obtained, demographic and clinical data were collected and recorded.

### Validity

In this study, we evaluated both content and construct validity. For construct validity, we assessed both convergent and discriminant validity.

#### *Content validity*

The Thai HHI was given to 5 experts to determine its content validity. All of the experts are bilingual, and all have

had experience in translation and instrument validation. They were asked to rate each of the 12 questions relative to their comparability or relevance to the original version, and whether or not each can evaluate the level of hope. Each question was then individually rated using a 4-point rating scale (from 1 = not relevant to 4 = highly relevant). Any item judged to be irrelevant by receiving a rating of 1 or 2 by more than 20% of experts would be amended. We then calculated the content validity index (CVI), the percentage of the total items rated as 3 or 4 for each question, and for all questions. A CVI score of 80% or higher is generally considered to indicate good content validity

#### *Construct validity*

Construct validity is composed of convergent and discriminant validity. Convergent validity was assessed by evaluating the correlation between the Thai HHI and the Rosenberg Self-Esteem Scale (RSES) using Spearman's correlation coefficient. We hypothesized that the Thai HHI would be positively correlated with the RSES since a previous study found that people with higher levels of self-esteem had higher levels of hope.<sup>(16)</sup> The RSES designed to measure self-esteem consists of 10 items. Responses are rated using a 4-point Likert scale that ranges from 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree), with a total possible score ranging from 10 to 40. Higher scores indicate higher levels of self-esteem. The RSES was translated to Thai and was evaluated for its psychometric properties which revealed good validity and reliability.<sup>(17)</sup>

Discriminant validity was evaluated by analyzing for correlation between the Thai HHI and the Patient Health Questionnaire-9 (PHQ-9) using Spearman's correlation coefficient. We hypothesized that the Thai HHI would be negatively correlated with the PHQ-9 because a previous study reported that people who have higher levels of hope are less likely to be affected by depression.<sup>(18)</sup> The PHQ-9, designed to screen for depression, consists of 9 items. A 4-point Likert scale (0 to 3) is used to answer each question (0 = not at all, 1 = several days, 2 = more than half of days, 4 = almost every day), and the total score ranges from 0 to 27. A higher score indicates a more severe degree of depression. The Thai version of the PHQ-9 was validated for its psychometric properties, which showed good validity and reliability.<sup>(19)</sup>

### Reliability

Reliability was evaluated by internal consistency and test-retest reliability. Internal consistency reliability of the translated instrument was assessed by defining the consistency of each question using Cronbach's alpha. Test-retest reliability was evaluated by re-administering the Thai HHI to 40 of the same 70 patients that took the Thai HHI one week earlier. The questions on the retest were the same as those on the first test, but the order of the questions was changed to prevent the carry-over effect.

### Sample size calculation

The sample size was calculated using data from a study by Chan et al. which is the research group that created the Chinese version of the HHI.<sup>(10)</sup> The sample size was calculated using the following variables: descriptive study with a type 1 error of 0.05, a type 2 error of 0.1, and an add-on of 10% to compensate for dropouts for any cause. The estimated number of participants for the validity and reliability tests were 70 and 40, respectively.

### Statistical analysis

CVI was calculated to evaluate content validity; Spearman's correlation coefficient was used to assess convergent and discriminant construct validity; Cronbach's alpha was used to evaluate internal consistency; and, intraclass correlation coefficient was used to measure test-retest reliability.

#### Range of construct validity<sup>(20)</sup>

Size of correlation	Interpretation
.90 to 1.00 (-0.90 to -1.00)	Very high positive (negative) correlation
.70 to .90 (-0.70 to -0.90)	High positive (negative) correlation
.50 to .70 (-0.50 to -0.70)	Moderate positive (negative) correlation
.30 to .50 (-0.30 to -0.50)	Low positive (negative) correlation
.00 to .30 (0.00 to -0.30)	Negligible correlation

#### Range of internal consistency<sup>(21)</sup>

Cronbach's alpha	Internal consistency
$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

#### Range of intraclass correlation coefficient<sup>(22)</sup>

Range of Intraclass correlation coefficient	Interpretation
$< 0.50$	Poor
$0.50 \leq ICC < 0.75$	Moderate
$0.75 \leq ICC < 0.90$	Good
$\geq 0.90$	Excellent

## Results

Seventy stroke patients who attended the Department of Rehabilitation Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University during December 2017 to August 2018 were enrolled in this study. The demographic and clinical characteristics of study patients are shown in Table 1.

Concerning validity, five experts were asked to judge the content validity of the Thai HHI. All experts gave all questions the highest score except for question number 3, which one expert gave a score of 2 out of 4 (low relevance). Nevertheless, when all scores from all experts were combined for question 3, an acceptable content validity index (CVI) of 0.80 was calculated. The overall content validity of the Thai HHI found to be high with a CVI of 0.983 (Table 2).

For convergent validity, the Spearman's correlation coefficient between the Thai HHI and the RSES was 0.563 ( $p < 0.01$ ), which indicates significant moderate positive correlation between the Thai HHI and the RSES (Table 3).

The correlation between the Thai HHI and the PHQ-9 was analyzed in order to define the discriminant validity. The Spearman's correlation coefficient between these two tests

**Table 1.** Demographic data of 70 participants

Variable	
Age (year) <sup>2</sup>	63.4 (11.4)
Sex <sup>1</sup>	
Male	42 (60)
Female	28 (40)
Underlying disease <sup>1*</sup>	
Hypertension	50 (71.4)
Dyslipidemia	32 (45.7)
Diabetes mellitus	19 (27.1)
Coronary artery disease	11 (15.7)
Prior stroke	2 (2.9)
Onset of stroke <sup>1</sup>	
$\leq 6$ months	13 (18.6)
$> 6$ months - 1 year	11 (15.7)
$> 1$ year - 5 years	28 (40.0)
$> 5$ years - 10 years	11 (15.7)
$> 10$ years	7 (10.0)
Hemiparesis side <sup>1</sup>	
Left	35 (50.0)
Right	33 (47.1)
Bilateral	2 (2.9)
Dominant hand <sup>1</sup>	
Left	11 (15.7)
Right	59 (84.3)
Recent stroke type <sup>1</sup>	
Ischemic	46 (65.7)
Hemorrhagic	24 (34.3)
Education <sup>1</sup>	
Below high school	27 (38.6)
High school	18 (25.7)
Bachelor degree	16 (22.9)
Above bachelor degree	9 (12.9)
Marital status <sup>1</sup>	
Single	15 (21.4)
Married	49 (70.0)
Divorced	6 (8.6)

<sup>1</sup>Number (%), <sup>2</sup>mean (SD)

\*Some participants had more than one underlying diseases

**Table 2.** Content validity of the Thai HHI among 5 experts

Question No.	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	No. in agreement	CVI
1	√	√	√	√	√	5	1.00
2	√	√	√	√	√	5	1.00
3	√	√	√	√	x	4	0.80
4	√	√	√	√	√	5	1.00
5	√	√	√	√	√	5	1.00
6	√	√	√	√	√	5	1.00
7	√	√	√	√	√	5	1.00
8	√	√	√	√	√	5	1.00
9	√	√	√	√	√	5	1.00
10	√	√	√	√	√	5	1.00
11	√	√	√	√	√	5	1.00
12	√	√	√	√	√	5	1.00
Total	1.00	1.00	1.00	1.00	0.917		0.983

HHI, Herth Hope Index; CVI, content validity index

√ indicated scores 3-4 of 4 points rating scale (acceptable), X indicated scores 1-2 of 4 points rating scale (unacceptable)

**Table 3.** Convergent validity of the Thai HHI compared to RSES

		Thai HHI	RSES
Spearman's	Correlation coefficient	1.000	0.563
Correlation coefficient	p-value	-	< 0.001

HHI, Herth Hope Index; RSES, Rosenberg self-esteem scale

**Table 4.** Discriminant validity of the Thai HHI compared to PHQ-9

		Thai HHI	PHQ-9
Spearman's	Correlation coefficient	1.000	-0.545
Correlation coefficient	p-value	-	< 0.001

HHI, Herth Hope Index; PHQ-9, Patient health questionnaire-9

**Table 5.** Internal consistency of the Thai version HHI, presented with Cronbach's alpha coefficient

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1. I have a positive outlook toward life.	33.00	11.217	.552	.460	.773
2. I have short and/or long-range goals.	33.13	10.751	.474	.414	.775
3. I feel all alone.	33.07	10.212	.446	.445	.781
4. I can see possibilities in the midst of difficulties.	33.09	10.717	.573	.504	.767
5. I have a faith that gives me comfort.	33.01	11.493	.278	.273	.794
6. I feel scared about my future.	33.63	11.164	.192	.474	.817
7. I can recall happy/joyful times.	32.83	11.275	.379	.474	.784
8. I have deep inner strength.	32.81	10.356	.630	.601	.760
9. I am able to give and receive caring/love.	32.93	11.198	.498	.449	.776
10. I have a sense of direction.	33.16	10.917	.402	.315	.783
11. I believe that each day has potential.	33.04	11.143	.544	.561	.773
12. I feel my life has value and worth.	32.93	10.531	.594	.617	.764

HHI, Herth Hope Index

was 0.545 ( $p < 0.01$ ), which indicates significant moderate negative correlation between the Thai HHI and the PHQ-9 (Table 4).

The Thai HHI was found to have acceptable internal consistency with a Cronbach's alpha of 0.794. Analysis of each question was performed in order to define the Cronbach's alpha when that question was deleted. All deletions of individual questions yielded a lower Cronbach's alpha except

for the deletion of question number 6, which yielded a higher Cronbach's alpha (0.817). The internal consistency for each question is given in Table 5.

The Thai HHI was re-administered to 40 of the 70 patients who took the test one week earlier in order to assess test-retest reliability. The order of the questions on the retest was different from the order on the first test to reduce the carry-over effect. The intraclass correlation coefficient of



**Table 6.** Test-retest reliability of the Thai version HHI, presented with intraclass correlation coefficient

	Intraclass Correlation	95% confidence interval		F Test with true value			
		Lower bound	Upper bound	Value	df1	df2	Sig
Average	0.776	.584	.880	4.467	41	41	< 0.01

0.776 (Table 6) indicated that the test-retest reliability of the Thai HHI is good.

## Discussion

Every question in the Thai HHI has a content validity index  $\geq 80\%$  and an overall content validity index of 0.983, which indicates good content validity.

Concerning construct validity, the Spearman's correlation coefficient between the Thai HHI and the RSES showed  $r = 0.563$ , which is defined as a moderate positive correlation (0.50-0.70).<sup>(20)</sup> The Spearman's correlation coefficient between the Thai HHI and the PHQ-9 revealed a moderate negative correlation ( $r = -0.545$ ). This finding supports our hypothesis, and corresponds with the findings of prior studies.<sup>(16,17)</sup> When we compared our findings with the findings of studies that translated the HHI into Chinese, Portuguese, German, and Italian, our results have the same moderate correlation. However, direct comparison with the exact same test could not be performed due to language-related limitations. The Chinese study compared the Chinese HHI with the RSES and the Hamilton Depression Scale, which is similar to the PHQ-9 depression screening tool that we used in our study. Our study showed the Thai HHI to have higher both convergent validity ( $r = 0.563$  vs.  $r = 0.40$ ) and higher discriminant validity ( $-0.545$  vs.  $-0.40$ ) than the Chinese HHI (both respectively).

The Cronbach's alpha for the Thai HHI was found to be 0.794, which is defined as acceptable internal consistency (0.7-0.8).<sup>(21)</sup> However, when compared with other studies, the Thai HHI was shown to have acceptable internal consistency, whereas the other studies showed good internal consistency. Importantly, when question number 6 was deleted, the Cronbach's alpha increased to 0.817, which increases the internal consistency rating for the Thai HHI from acceptable to good (0.8-0.9).<sup>(21)</sup> A further study with question number 6 reevaluated and retranslated is recommended so that the Thai HHI will have higher internal consistency.

The intraclass correlation coefficient of the test-retest reliability of the Thai HHI was 0.776, which is rated as good (0.75-0.90).<sup>(22)</sup> When compared with other studies, our study has higher test-retest reliability than the Portuguese and the Italian studies (good vs. moderate), and has the same level of test-retest reliability with the Chinese and the German studies (good). However, when compared with the original version of the HHI, the Thai HHI has a lower intraclass correlation coefficient (0.776 vs. 0.91, respectively). Nonetheless, the original study only had 20 participants in the test-retest group and the order of the questions was the same on both

the first test and the retest, so it is possible that their finding was somehow influenced by the carry-over effect.

The limitations of this study include the fact that we did not perform criterion validity due to the lack of a standard test for determining hope level in Thai population, and that only stroke patients were studied, which could limit the generalizability of our findings to other patient populations. In addition, we did not conduct our study according to guidelines for the process of cross-cultural adaptation of self-report measures because we were unable to find two native English speakers who are both fluent in Thai, instead we performed our research according to protocol by Suraseranivongse S.<sup>(23)</sup>

In conclusion, the Thai HHI was found to have good to moderate psychometric properties as evidenced by good content validity, moderate construct validity, acceptable internal consistency, and good test-retest reliability. These findings suggest that the Thai HHI can be used to evaluate hope among Thai stroke patients.

## Disclosure

All authors declare no personal or professional conflicts of interest relating to any aspect of this study.

## Acknowledgements

The authors gratefully acknowledge Mr. Suthipol Udompuntharak for assistance with statistical analysis.

This research project was supported by the Faculty of Medicine Siriraj Hospital, Mahidol University, Grant Number (IO) R016131017.

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## Appendix: Thai version of the Herth Hope Index

	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. ฉันมีมุมมองที่ดีเกี่ยวกับชีวิตของฉัน				
2. ฉันมีเป้าหมายในการดำเนินชีวิต				
3. ฉันรู้สึกโดดเดี่ยว				
4. ฉันมองเห็นทางออกสำหรับปัญหาต่าง ๆ ในชีวิต				
5. ฉันมีที่ยึดเหนี่ยวทางจิตใจ				
6. ฉันรู้สึกกังวลเกี่ยวกับอนาคตของฉัน				
7. ฉันยังจดจำช่วงเวลาดี ๆ ในชีวิตได้				
8. จิตใจของฉันยังเข้มแข็งอยู่				
9. ฉันยังสามารถให้และได้รับความห่วงใยแก่ผู้อื่น				
10. ฉันรู้ว่าชีวิตฉันกำลังดำเนินไปในทิศทางใด				
11. ฉันเชื่อว่าทุก ๆ วันมีความหมาย				
12. ฉันรู้สึกว่าชีวิตของฉันมีคุณค่าและมีความหมาย				