

# Reliability and Validity of the Cross-Culturally Adapted Thai Version of the Tampa Scale for Kinesiophobia in Knee Osteoarthritis Patients

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## Abstract

**Purpose:** The aim of this study was to develop a cross-culturally adapted Thai version of the Tampa Scale for Kinesiophobia (TSK) and investigate its reliability and validity among patients with knee osteoarthritis.

**Methods:** The TSK was translated into Thai language and culturally adapted in line with the international standards. The Thai TSK questionnaire was then tested for internal consistency, test-retest reliability, and convergent validity by comparing it with the visual analogue scale, Western Ontario and McMaster Universities Osteoarthritis Index, State-Trait Anxiety Inventory, and Timed Up and Go Test.

**Results:** Eighty patients with knee osteoarthritis were included in the study. The Thai version of the TSK was easily comprehended and completed within 6 minutes. The questionnaire showed a good internal consistency ( $\alpha = 0.90$ ) and high test-retest reliability {ICC (2,1) = 0.934}. Convergent validity showed high correlations with the visual analogue scale, Western Ontario and McMaster Universities Osteoarthritis Index, and State-Trait Anxiety Inventory ( $r = 0.741, 0.856,$  and  $0.817$ , respectively). However, there was no significant correlation between the Thai version of the TSK scores and the Timed Up and Go Test results.

**Conclusion:** The Thai version of the TSK has satisfactory reliability and validity for the evaluation of pain-related fear of movement/(re)injury in patients with knee osteoarthritis.

**Keywords:** reliability, knee osteoarthritis, validity

## Introduction

Knee osteoarthritis (OA) is a leading cause of pain, disability, and poor quality of life worldwide (1–3). The prevalence of knee OA was found to be 59.4% in Thai elderly people (4). Several factors including pathological interactions between patients, their working environments, and psychosocial factors may relate to their pain and physical dysfunction (5). There has been a growing recognition of the fact that the fear of pain related to painful or harmful

activities is an important cognitive factor in relation to chronic pain and disability, anxiety, depression, and effectiveness of treatment in knee OA patients (5–8). Therefore, the clinical tools, evaluating pain-related fear, may help to reduce chronic pain, disability, anxiety, gait imbalance, and other poor consequences.

To specifically evaluate pain-related fear, Kori and colleagues (9) developed the original Tampa Scale for Kinesiophobia (TSK), a 17-item self-administered questionnaire for measuring the fear of movement/(re)injury in chronic pain

patients. While applying the TSK evaluation to non-English speaking subjects, it is necessary to perform the translation and cultural adaptation of the questionnaire appropriately. The TSK has been validated in several languages including Norwegian (7), Swedish (10), Portuguese (11), Spanish (12), Chinese (13) and Persian (14). As a fully cross-cultural adaptation of the TSK in Thai language has not been developed and psychometrically assessed, Thai researchers and health providers are facing limitations in using it for the evaluation of outcomes in knee OA patients. This evaluation is intended to increase the success rates of a specific treatment for OA knee patients associated with fear of movement or (re)injury. The purpose of the present study was to develop a cross-culturally adapted Thai version of the TSK and validate it in patients with knee OA.

## Material and Method

### Study design

This descriptive cross-sectional study was approved by the human ethic committee of Mae Fah Luang University in accordance with the 1964 Helsinki Declaration. All participants gave the written informed consent before participation. This study was conducted in the Physical Therapy Laboratory, Mae Fah Luang University, Thailand.

### Participants

Eighty participants, who were conveniently available and willing to participate in the study, were recruited from naturally formed groups of OA knee patients living in Nanglae Sub-District, Chiang Rai province, Thailand between June and August 2014. They were diagnosed with knee OA using the criteria described previously by Zhang et al. (15), which was performed by a medical doctor who was unaware to the participants. The inclusion criteria were chronic knee pain for at least three months and the presence of any three of the following six items: age of at least 50 years old, morning knee stiffness for less than 30 minutes, crepitus, bony enlargement of the knee, bony tenderness, and no visible inflammation (15). The exclusion criteria were infection, tumor, autoimmune diseases, recent knee fracture, and receiving knee arthroplasty.

### Procedures and measurement tools

Translation and cross-cultural adaptation were permitted by the authors of the original

version of the TSK. The Thai version of the TSK was cross-culturally adapted in four steps according to Beaton's guidelines (16). Firstly, the original English version was translated into Thai by two Thai physiotherapists who arrived at a consensus on an initial Thai version. Secondly, two professional bilingual translators carried out the backward translation of the initial version. Thirdly, the English translation was compared with the original version and checked for any discrepancies by a committee of two physiotherapists and two professional bilingual translators. The discrepancies were corrected in the final Thai version. Finally, the final version was tested in 10 Thai knee OA patients for comprehension, and comments were collected for further modifications to the final version. A copy of the Thai version of TSK is in the Appendix.

After the Thai version of TSK was finally developed, the reliability and validity of the Thai version of TSK were tested.

The demographic characteristics and outcome measures of the participants were collected and recorded by a well-trained research assistant and a licensed physical therapist. The time taken to answer the questionnaire was recorded, and the Thai version was measured twice with a time interval of 24 hours for assessing the test-retest reliability.

The TSK score was calculated on a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree), which was designed to evaluate pain-related fear of movement/(re)injury. Four (items 4, 8, 12 and 16) out of 17 items are negatively phrased and therefore, reverse scored. The total score ranges from 17 to 68, and higher scores denote a higher level of pain-related fear (9). Details of original English and Thai versions can be found in Table 1 and Appendix, respectively. The total score of the original English version of the TSK has shown acceptable internal consistency (Cronbach alpha from 0.68 to 0.80) and test-retest reliability ( $r = 0.78$ ) (24).

The visual analogue scale (VAS), which measures pain intensity, is a 10-cm linear line with two anchors: 0—representing "no pain at all" and 10—representing "the worst imaginable pain" (17).

The Thai version of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) has been reliably used for measuring disability. It is a 22-item instrument for evaluating pain, stiffness, and physical function in knee OA patients (18). Each item is scored on an 11-point numerical rating scale (0–10) with

a maximum total of 220 points. Higher scores represent a greater functional limitation.

The Thai version of State-Trait Anxiety Inventory (STAI) is a 20-item inventory on how a patient feels at the moment. Characteristic items, which include "I feel calm" and "I am regretful," are answered in terms of severity (not at all, a little, somewhat, and very much) (19). The overall STAI scores range from 20 to 80, where higher scores indicate greater levels of anxiety.

The Timed Up and Go Test (TUGT), as described previously, is an established method to assess the functional balance and basic mobility skills of knee OA patients (20). During this test, the assessor instructed the patient (say "Go") to stand up from a chair, walk three metres, turn around, walk back to the chair, and again sit down on the chair and recorded the time taken by each participant (Start timing on the word "Go" and stop timing when the patient is seated again correctly in the chair).

### Statistical analysis

All analyses were performed using the SPSS statistical package, version 16.0 for Windows (SPSS Inc., Chicago, IL, USA), and the significance level was set at 0.05.

The demographic characteristics and time taken to answer the questionnaire represented acceptability and are presented as mean and standard deviation.

Cronbach's alpha ( $\alpha$ ) coefficient was used to assess the internal consistency of the Thai version of the TSK. Interpretation of the alpha level was as follows: at least 0.80, good; 0.70–0.80, moderate; and less than 0.70, low.

Test-retest reliability was assessed using the intraclass correlation coefficient {ICC (2,1)}, which was interpreted as follows: at least 0.75, high reliability; 0.40–0.75, moderate reliability; and less than 0.40, low reliability.

Convergent validity was assessed using Pearson product-moment correlation coefficients

**Table 1.** Original version of Tampa Scale for Kinesiophobia

	Strongly disagree	Disagree	Agree	Strongly agree
1. I'm afraid that I might injury myself if I exercise	1	2	3	4
2. If I were to try to overcome it, my pain would increase	1	2	3	4
3. My body is telling me I have something dangerously wrong	1	2	3	4
4. My pain would probably be relieved if I were to exercise	1	2	3	4
5. People aren't taking my medical condition seriously enough	1	2	3	4
6. My accident has put my body at risk for the rest of my life	1	2	3	4
7. Pain always means I have injured my body	1	2	3	4
8. Just because something aggravates my pain does not mean it is dangerous	1	2	3	4
9. I am afraid that I might injure myself accidentally	1	2	3	4
10. Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening	1	2	3	4
11. I wouldn't have this much pain if there weren't something potentially dangerous going on in my body	1	2	3	4
12. Although my condition is painful, I would be better off if I were physically active	1	2	3	4
13. Pain lets me know when to stop exercising so that I don't injure myself	1	2	3	4
14. It's really not safe for a person with a condition like mine to be physically active	1	2	3	4
15. I can't do all the things normal people do because it's too easy for me to get injured	1	2	3	4
16. Even though something is causing me a lot of pain, I don't think it's actually dangerous	1	2	3	4
17. No one should have to exercise when he/she is in pain	1	2	3	4

(*r*) of the Thai version of the TSK with VAS, WOMAC, STAI, and TUGT, respectively. Interpretation of the correlation level was: 0.90–1.0, very high correlation; 0.70–0.89, high correlation; 0.50–0.69, moderate correlation; 0.26–0.49, low correlation; and 0.0–0.25, very little correlation.

## Results

The demographic characteristics of the participants are shown in Table 2. The TSK-17 questionnaire was completed in 5.11 ± 1.43 minutes without problems in comprehension, missing responses, or multiple answers from any of the participants, which supported a high degree of questionnaire acceptability.

**Table 2.** Demographic characteristics of the participants (*n* = 80)

Characteristics	<i>n</i> (%)	mean ± SD
<b>Demographic data</b>		
Age (years)		65.53 ± 9.39
Gender ( <i>n</i> of females)	53 (66.25)	
Weight (kg)		57.60 ± 13.11
Height (centimeter)		155.87 ± 9.16
<b>Occupation</b>		
Farmer	24 (30)	
Trader	25 (31.25)	
Employee	13 (16.25)	
None	18 (22.50)	
<b>Health status</b>		
<b>Knee pain</b>		
Right side	29 (36.25)	
Left side	25 (31.25)	
Both side	26 (32.5)	
Severity of knee pain: by pain scale,		6.27 ± 2.38
Duration of knee pain episode (months)		37.47 ± 47.89
<b>Underlying condition,</b>		
Hypertension	29 (36.25)	
Diabetes	22 (27.5)	
Hyperlipidemia	11 (13.75)	
Asthma	1 (1.25)	
None	17 (21.25)	
<b>Outcome measures</b>		
TSK-17		57.47 ± 9.52
VAS (cm)		6.28 ± 2.28
WOMAC (score)		5.05 ± 2.29
STAI (score)		47.27 ± 15.06
TUGT (second)		15.42 ± 11.48

The Cronbach's alpha coefficient for each item is shown in Table 3 and the overall Cronbach's alpha was 0.90, which indicated a good internal consistency. Test-retest reliability with a time interval of 24 hours also showed high reliability, ICC (2,1) = 0.934, 95% confidence interval; CI 0.861 to 0.968, *P* < 0.001).

**Table 3.** Cronbach's alpha of items of Thai version of the Tampa Scale for Kinesiophobia

Subscales	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	.705	.888
Q2	.456	.898
Q3	.365	.899
Q4	.758	.886
Q5	.640	.891
Q6	.583	.893
Q7	.535	.897
Q8	.639	.892
Q9	.554	.894
Q10	.523	.897
Q11	.559	.894
Q12	.686	.889
Q13	.627	.894
Q14	.608	.892
Q15	.554	.894
Q16	.593	.893
Q17	.273	.903

Q = Each question of subscales of Thai version of the Tampa Scale for Kinesiophobia

Table 4 shows the correlations between the total score of the Thai version of TSK and other outcomes. There were significant correlations between the Thai version of the TSK and the VAS (*r* = 0.741), WOMAC (*r* = 0.856), and STAI (*r* = 0.817), (*P* < 0.01), but there was no significant correlation with the TUGT.

## Discussion

This study showed a good internal consistency, high test-retest reliability, and good convergent validity for the Thai version of the TSK questionnaire in knee OA patients. The standardised process used for cross-cultural adaptation of the Thai version certified that the meaning of the original version was sufficiently

maintained by idiomatic translation. The Thai version of the TSK questionnaire was found to be highly acceptable among the researchers and the patients found it easy to answer, and it could be self-administered within 6 minutes.

Although TSK has been translated into many languages (7, 10–13) and shown an acceptable internal consistency in several types of patients (7, 14–15), there has been a lack of evaluations of the TSK in knee OA patients. This study was the first to show the highly reliable internal consistency (0.90) of all items of the Thai version of the TSK for knee OA patients.

We have also demonstrated a high test-retest reliability of the Thai version of the TSK-17 and chose a 24-hour interval for retest in order to minimise any bias due to the changes in clinical status of the patients (21). In addition, different colored papers were used for the first and second self-administered TSK questionnaires in order to eliminate recall bias.

There are previous studies that showed high test-retest reliability of Persian [(ICC = 0.80)14] and Brazilian-Portuguese [(ICC = 0.93)11] versions of the TSK but not in patients with knee OA. As there was no previous research in English that evaluated test-retest reliability in patients with knee OA, we were not able to make any comparison of our study findings with that of other studies published in English.

Correlation analyses showed that greater pain-related fear was associated with greater pain, disability, and anxiety in knee OA patients. Prior studies also supported our findings that pain-related fear may influence clinical, psychological, and functional outcomes in knee OA patients (6, 22). Fitzgerald and colleagues (23) suggested that improvement in fear of physical activity was associated with enhancement of positive treatment response following exercise in knee OA patients. However, the present study failed to show a correlation between pain-related fear and the TUGT, possibly because the latter is affected by several other factors, such as lower limb

muscle strength, balance and side of knee pain. Although the TUGT is a reliable outcome measure for assessing walking and balance performances (by commanding patients to rise from a chair, maintain their balance, and walk), its components may be so familiar to patients that they do not cause fear to perform them, and therefore, scoring of the TUGT is not adversely affected.

As this study was limited to Thai elderly with knee OA, further research in other knee pain conditions, such as patellofemoral joint syndrome, using the Thai version of the TSK would allow for a wider application. In addition, this study assessed the pain at rest only, which may not correlate with pain during activities. Future study would help in measuring the pain intensity on activities such as walking in order to assess whether there is the correlation between TSK and pain on activities. Another limitation was that the patients who participated in reliability and validity testing were recruited via convenience sampling. This sampling method was implemented because the researchers intended to recruit all OA knee patients living in Nanglae sub-district who were conveniently available to participate in the study during the experimental period. However, the generalisability might be limited.

## Conclusion

The Thai version of the TSK is comprehensible and has good psychometric properties in the assessment of pain-related fear of movement/(re)injury in knee OA patients.

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**Table 4.** Convergent validity: Pearson's correlations between the Thai version of the TSK and other clinical outcome measures

	Thai version of the TSK	<i>P</i> -value
Visual analogue scale (VAS)	$r = 0.741$	< 0.001
Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)	$r = 0.856$	< 0.001
State-Trait Anxiety Inventory (STAI)	$r = 0.817$	< 0.001
Timed Up and Go Test (TUGT)	$r = 0.138$	0.470

## Conflicts of Interest

The authors report no conflict of interest

## Authors' Contributions

Conception and design: PA, VB  
Analysis and interpretation of the data: PA  
Drafting of the article: PA, VB  
Critical revision of the article for important intellectual content: PA, VB  
Final approval of the article: VB  
Provision of study materials or patients: PA, VB  
Statistical expertise: PA  
Administrative, technical, or logistic support: PA, VB  
Collection and assembly of data: PA, VB

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