

Original Article

# Cross-cultural adaptation, reliability, and validity of the Northern Thai version of the Tampa scale of kinesiophobia-17 in community-dwelling individuals with knee osteoarthritis

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## Abstract

This study was designed to determine the validity and reliability of the northern Thai version of the TSK-17 in community-dwelling people with knee osteoarthritis (KOA). Participants with knee osteoarthritis living in Chiang Rai province were invited to participate in this study and were asked to complete the northern Thai version of the questionnaire. TSK-17 northern Thai version was administered twice with a seven-day interval, as was the Thai version of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Furthermore, the participants completed the Thai version of the medical outcomes study short-form survey version 2.0 (SF-36V2) and a timed-up and go test (TUGT). The findings revealed that 50 people took part in this study and completed the northern Thai version of the TSK-17 in five minutes. The TSK-17 northern Thai version demonstrated high internal consistency ( $\alpha = 0.80$ ) and test-retest reliability ( $ICC_{2,1} = 0.84$ ). Convergent validity demonstrated a strong correlation with the Thai version of WOMAC ( $r = 0.70$ ) and a weak correlation with the TUGT ( $r = 0.45$ ). According to the findings of this study, the northern Thai version of the TSK-17 has acceptable validity and reliability for evaluating fear of movement in community-dwelling individuals with KOA.

**Keywords:** fear of movement, knee degeneration, physical activity, psychometric property

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## 1. Introduction

Knee osteoarthritis (KOA) in middle-aged and older adults is a major public health issue around the world. It also leads to disability, unemployment, and incurred medical costs (Callhoff *et al.*, 2020). According to epidemiological studies, the prevalence of osteoarthritis in China is approximately 21.51 percent (Sun *et al.*, 2019), but it is 26.24 percent in Thailand (Bosittipichet, Chinasote, & Leesri, 2018). According to a recent study, the government is obligated to pay up to 15,558 US dollars in medical expenses of each knee osteoarthritis patient, which is considered a high health welfare burden (Chen, Su, Bedenbaugh, & Oruc, 2020).

In addition to physical suffering such as knee pain and joint stiffness, fear of movement in activities such as walking and anxiety about their physical condition are potential factors affecting the quality of life of KOA patients (Park, Kim, & Lee, 2020). Lower limb muscle weakness and decreased physical activity may result from the fear behaviors associated with physical and psychological problems in KOA (Aykut Selçuk, & Karakoyun, 2020; Meulders, 2019). Previous studies have discovered a link between fear of movement and pain, as well as disability (Lazaridou *et al.*, 2019), anxiety, and depression in KOA patients (Kilinc, Karahan, Atilla, & Kinikli, 2019). If the fear of movement is not addressed properly, it may lead to a lack of physical activity, disability, dependence, and poor clinical outcomes (Aykut Selçuk, & Karakoyun, 2020; Levinger, Menz, Wee, Feller, Bartlett, & Bergman, 2011).

The Tampa scale of kinesiophobia questionnaire-17, TSK-17 for short, is currently used to assess fear of

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movement. It is one of the clinical tests used to assess people with KOA (Aykut Selçuk, & Karakoyun, 2020). The questionnaire contains 17 questions designed to assess the fear of movement while performing activities or exercising. Each question has four options, and the total score ranges from 17 to 68 points. A higher score indicates a stronger fear of movement. The TSK-17 has been translated into several languages (Cai, Liu, Woby, Genoosha, Cui, & Guo, 2019; Gómez-Pérez, López-Martínez, & Ruiz-Párraga, 2011; Monticone, Giorgi, Baiardi, Barbieri, Rocca, & Bonezzi, 2010), including the standard Thai version, which has demonstrated high reliability ( $\alpha = 0.90$ ) and a strong correlation with the Thai version of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) ( $r = 0.856$ ) and the Thai version of the State-Trait Anxiety Inventory ( $r = 0.817$ ) (Areudomwong, & Buttagat, 2017).

However, using the standard Thai version of the TSK-17 with people from different regions, particularly the elderly with KOA who have been in the Northern area of Thailand, may be difficult due to differences in spoken Thai language (local Thai Lanna language) and comprehension of the expected content of the questionnaire, which may affect the correctness of their answers. This may have an impact on the efficacy of KOA treatments and lead to poor clinical outcomes. Furthermore, no previous research has cross-culturally translated the TSK-17 into its northern Thai version. The purpose of this study was to determine the reliability and validity of the Northern Thai version of the TSK-17 for people living in the community who have KOA. This research will help healthcare professionals in using this questionnaire to assess fear of movement in people with KOA who speak Northern Thai as their primary language.

## 2. Materials and Methods

### 2.1 Study design

This was a cross-sectional study that was certified in Human Research Ethics by the Research Ethics Committee of Mae Fah Luang University (EC 21045-25) in accordance with the Helsinki Declaration. All eligible participants who met the inclusion criteria and were interested in participating in the study were thoroughly informed about the study protocol and rights protection. Before taking part in the study, each participant signed a voluntary consent form. This research was carried out at the Nang Lae and Mae Khao Tom Subdistrict Health Promoting Hospitals in Chiang Rai, Thailand, between January and April 2022.

### 2.2. Participants

Male and female participants with chronic knee pain from Nang Lae and Mae Khao Tom Subdistricts, Chiang Rai, Thailand were recruited for the study. The inclusion criteria were 1) knee pain for more than three months, 2) had positive findings in at least three of the six following questions or tests according to the American College of Rheumatology: aged 50 years or over, knee stiffness less than 30 minutes, crepitation while moving the knee, knee bony enlargement, tender points around the knee, and no inflammatory swelling of the knee (Salehi-Abari, 2016), as determined by an orthopedist with

experience treating musculoskeletal patients more than 10 years, and 3) capable of reading, communicating, and comprehending standard Thai and northern Thai. Exclusion criteria included knee cancer, knee infection, autoimmune diseases such as rheumatoid arthritis, knee fractures, knee replacement surgery, and severe knee pain that prevented movement or weight-bearing activities.

### 2.3 Sample size determination

According to the findings of Javali *et al.* (Javali, Gudaganavar, & Raj, 2011), the appropriate and sufficient sample size for determining the internal consistency of a questionnaire with 4-5 Likert scale options would be at least 50 samples. As a result, 50 people were invited to participate in this study.

## 2.4 Methodology

### 2.4.1 Translation and cross-cultural adaptation

Translation and cross-cultural adaptation were carried out in the following six steps, as suggested by Beaton *et al.* (Beaton, Bombardier, Guillemin, & Ferraz, 2000):

#### 1) Forward translation

Two bilingual northern Thai native speakers (fluent in both spoken standard Thai and northern Thai) independently translated the TSK-17 from standard Thai to northern Thai. One translator was informed about the purpose of the questionnaire and had a medical background. The second translator had no medical background and had no prior knowledge of the purpose or use of TSK-17. Both delivered a written report independently.

#### 2) Synthesis of the northern Thai version of TSK-17

The two written reports were synthesized into one northern Thai version by consensus of the two translators.

#### 3) Back translation of the synthesis

The synthesized northern Thai version of TSK-17 was then independently translated back to the standard Thai language by two translators who spoke standard Thai as their first language and had extensive knowledge of the northern Thai language and culture.

#### 4) Expert committee review to achieve the pre-final northern Thai version

All of the translators were on the expert committee, as well as a general practitioner, a physiotherapist, and a Thai language specialist. This committee reviewed the standard Thai version, northern Thai versions, and the back-translations. By consensus, the expert committee developed the pre-final version by discussing the semantic, idiomatic, experiential, and conceptual equivalence, made the necessary changes, and documented the adaptations in a written report.

**5) Testing of the pre-final version and adaptation to the final northern Thai version**

The pre-final version was tested on 10 people who had KOA and had been diagnosed by an orthopedist. The title, instructions, and questions were all rated as clear and comprehensive by all participants. Furthermore, free comments could be included about what they thought of each questionnaire item and what the chosen response meant. In addition, the time required to complete the questionnaire was recorded.

**6) Revising the final version**

The expert committee made final adaptations based on the pre-test comments before reliability and validity testing.

**2.4.2 Data collection and outcome measures**

A researcher who was unaware of the recruitment and translation procedures of the northern Thai TSK-17 collected all data on participant characteristics, clinical questionnaires, and the dynamic balance performance test. All participants were asked to complete the northern Thai version of the TSK-17 and clinical questionnaires in a Google Form using the tablets of researchers, while researchers who were five-year experienced physiotherapists trained in the questionnaires used for knee osteoarthritis assisted the participants if they had any questions. TSK-17 from northern Thailand was collected twice, with a 7-day interval between each collection. We assumed that seven days would be enough time for participants to forget the results of the first completed

questionnaire (Brown, Trost, Bauman, Mummery, & Owen, 2004), and it may also reduce the risk of unwanted clinical change (Marx, Menezes, Horovitz, Jones, & Warren, 2003). However, if the participants changed their physical activity and medication use, or received other interventions, such as exercise therapy within the period of the study, they were terminated from the study. Other clinical questionnaires, such as the Thai version of the Western Ontario and McMaster Universities arthritis index (WOMAC), the Thai version of the short-form survey version 2.0 (SF-36V2), and the timed up and go test, were only evaluated once.

**1) The northern Thai version of the TSK-17**

The northern Thai version of TSK-17 had 17 questions designed to assess fear of movement during movements and exercises (Table 1). Each question had a 4-point Likert scale with a total score ranging from 17 to 68, with the high range of scores indicating extreme fear of movement (Areeudomwong, & Buttagat, 2017).

**2) The Thai version of the Western Ontario and McMaster Universities arthritis index (WOMAC)**

The Thai version of WOMAC is a reliable and accurate questionnaire that is commonly used in the evaluation of patients with KOA. This questionnaire has three dimensions: pain, knee joint stiffness, and physical activity. The total score of three dimensions was used for analysis in this study. A lower overall score indicates that the participant is able to engage in more physical activity (Kuptniratsaikul, & Rattanachaiyanont, 2007).

Table 1. The Northern Thai version of Tampa Scale of Kinesiophobia-17

แบบสอบถามสเกลของเทมปาสำหรับการกลัวในการเคลื่อนไหว ฉบับภาษาไทยภาคเหนือ					
คำชี้แจง: กรุณาวางกลมที่ตัวเลือกที่ตรงกับท่านมากที่สุด					
		ไม่เห็นด้วยขนาด	ไม่เห็นด้วย	เห็นด้วย	เห็นด้วยขนาด
1	ตัวเสแสร้งว่าอาจจะได้จับบาดเจ็บ ถ้าไปออกกำลังกาย	1	2	3	4
2	ถ้าตัวเสแสร้งที่จะเคลื่อนไหวหรือได้ ออกกำลังกายของตัวเสแสร้งนั้น	1	2	3	4
3	ร่างกายของตัวเสแสร้งบอกว่า ออกกำลังกายที่มีอยู่ นี้ สักจะเป็นสัญญาณเตือนอันตราย	1	2	3	4
4	ออกกำลังของตัวเสแสร้ง สักจะเหนื่อยลงถ้าได้ออกกำลังกาย	1	2	3	4
5	คนอื่นมักจะบ่งชี้ว่า ว่าคุณเสแสร้งปวดแต่ๆ	1	2	3	4
6	อุบัติเหตุที่เกิดขึ้น หรือตัวเสแสร้งที่อยู่ในอันตรายไปตลอดชีวิต	1	2	3	4
7	ออกกำลังของตัวเสแสร้งรู้สึกอยู่นั้น หมายความว่าตัวเสแสร้งได้จับบาดเจ็บ	1	2	3	4
8	สิ่งกระตุ้นออกกำลังของตัวเสแสร้ง บ่งชี้หมายความว่ามันจะเป็นอันตราย	1	2	3	4
9	ตัวเสแสร้งว่า ตัวเสแสร้งจะหือตัวเสแสร้งได้จับบาดเจ็บโดยไม่ได้ตั้งใจ	1	2	3	4
10	ดวงดีที่สุดคือจะช่วยป้องกันหรือปวดนั้นขึ้น คือบดเคี้ยวเคลื่อนไหวโดยบังจำเป็น	1	2	3	4
11	ตัวเสแสร้งจะปวดนั้นขึ้นนี้ สักจะมีหรือยังบางอย่างที่อันตรายเกิดขึ้นกับร่างกายของตัวเสแสร้ง	1	2	3	4
12	ถึงแม้ว่าตัวเสแสร้งรู้สึกปวด แต่อกันของตัวเสแสร้งดีขึ้นถ้าได้เคลื่อนไหวร่างกาย	1	2	3	4
13	ออกกำลังของตัวเสแสร้งรู้สึก ว่า เมื่อใดควรหยุดออกกำลังกายเพื่อหลีกเลี่ยงการบาดเจ็บ	1	2	3	4
14	มันจะปวดตลอดเลย ถ้าจะหือคนที่ออกกำลังกับตัวเสแสร้งไปออกกำลังกาย	1	2	3	4
15	ตัวเสแสร้งสามารถจะดูอย่างดีคนปกติจะได้ เพราะว่าตัวเสแสร้งได้จับบาดเจ็บได้ง่ายกว่าคนอื่น	1	2	3	4
16	ตัวเสแสร้งคิดว่าสิ่งที่จะหือปวดขนาดนั้น จะเป็นอันตรายเสมอไป	1	2	3	4
17	คนที่กำลังมีอกันเจ็บปวด บดเคี้ยวจะออกกำลังกาย	1	2	3	4

### 3) The Thai version of the short-form survey version 2.0 (SF-36V2)

The Thai version of the SF-36V2 is divided into two parts: 1) the physical component summary, which includes four sub-components: physical functioning, role physical, bodily pain, and general health, and 2) the mental component summary, which includes four sub-components: vitality, social functioning, role emotion, and mental health. The reliability of this questionnaire was high (Cronbach's alpha of the physical component summary = 0.93 and the mental component summary = 0.92) (Jirarattanaphochai, Jung, Sumananont, & Saengnipanthkul, 2005).

### 4) Dynamic balance performance test

The Timed up and go test is a highly reliable test for evaluating dynamic balance performance. The participants stood up from the chair with the backrest and walked three meters forward, around the cone, and back to the chair, where they sat down. Participants walked as quickly as they could while remaining safe. The dynamic balance performance was recorded in seconds from the participant standing up to returning to the chair (Podsiadlo, & Richardson, 1991). Two tests with 1-minute interval were performed, and the average time was calculated.

#### 2.4.3 Statistical analysis

The Statistics Package for Social Science (SPSS) version 22.0 was used to analyze all data, and the significance level was set at 0.05. Descriptive statistics were used to examine participant characteristics as well as response time to the questionnaire.

The internal consistency of the northern Thai version of TSK-17 was determined using Cronbach's Alpha statistic interpreted as high reliability ( $\alpha > 0.80$ ), moderate reliability ( $\alpha = 0.70-0.80$ ), or low reliability ( $\alpha < 0.70$ ) (Andresen, 2000).

The intraclass correlation coefficient (ICC<sub>2,1</sub>) was used to analyze the test-retest reliability of the northern Thai version of TSK-17, which was reported as having very high reliability (ICC > 0.90), high reliability (ICC = 0.75-0.90), moderate reliability (ICC = 0.50-0.75), or low reliability (ICC 0.50) (Koo, & Li, 2016).

The Pearson Product Moment Correlation Coefficient statistic was used to assess the convergent validity of the northern Thai version of TSK-17, the Thai version of WOMAC, the Thai version of SF-36V2, and the Timed up and go test, and the results are reported as high correlation ( $r > 0.60$ ), moderate correlation ( $r = 0.30-0.60$ ), or low correlation ( $r < 0.30$ ) (Andresen, 2000).

## 3. Results

The characteristics of the participants are shown in Table 2. Participants completed the northern Thai version of the TSK-17 questionnaire in  $4.94 \pm 1.36$  minutes without misunderstanding the content or losing data.

Table 3 shows the high internal consistency of the northern Thai version of TSK-17 ( $\alpha = 0.80$ ), as well as the high test-retest reliability (ICC<sub>2,1</sub> = 0.84,  $p < 0.001$ ).

The convergent validity of the northern Thai version of TSK-17 with other clinical questionnaires and tests is shown in Table 4.

Table 2. Characteristics of the participants (n = 50)

Variable	Number (%)	Mean $\pm$ standard deviation
Gender (female)	46 (92)	
Age (year)		66.71 $\pm$ 3.57
Height (centimeter)		153.68 $\pm$ 2.11
Weight (kilogram)		59.70 $\pm$ 1.46
Occupation		
Farmer	8 (16)	
Business owner	12 (24)	
Employee	5 (10)	
No occupation	25 (50)	
Side of knee pain		
Right-handed side	24 (48)	
Left-handed side	12 (24)	
Both sides	14 (28)	
Duration of knee pain (year)		3.15 $\pm$ 0.59
Knee pain intensity measured using visual analogue scale (centimeter)		5.74 $\pm$ 0.40
The northern Thai version of TSK-17		55.12 $\pm$ 7.36
The Thai version of WOMAC (score)		67.00 $\pm$ 20.00
The physical component summary of the Thai version of SF-36V2 (score)		43.89 $\pm$ 6.63
The mental component summary of the Thai version of SF-36V2 (score)		27.80 $\pm$ 5.36
Timed up and go test (second)		13.87 $\pm$ 2.92

Remark: TSK-17, Tampa Scale of Kinesiophobia Questionnaire-17; WOMAC, Western Ontario and McMaster Universities arthritis index; SF-36V2, Short-form survey version 2.0

Table 3. Internal consistency of the northern Thai version of Tampa scale of kinesiophobia-17 for community-dwelling individuals with knee osteoarthritis

Question	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted*
1	54.76	29.86	0.30	0.79
2	54.70	28.41	0.46	0.77
3	54.82	26.55	0.70	0.75
4	54.30	32.13	0.20	0.79
5	54.46	29.80	0.31	0.79
6	55.12	27.74	0.52	0.77
7	54.54	27.47	0.54	0.77
8	55.08	32.19	0.37	0.79
9	54.32	31.16	0.37	0.78
10	54.66	27.69	0.58	0.76
11	54.76	30.06	0.40	0.78
12	54.42	30.82	0.31	0.78
13	54.34	30.10	0.51	0.77
14	54.40	31.06	0.32	0.78
15	54.24	31.81	0.27	0.79
16	54.30	31.92	0.22	0.79
17	55.10	28.82	0.25	0.80

Remark: \* $p < 0.01$

Table 4. Convergent validity of the northern Thai version of kinesiophobia-17 for community-dwelling individuals with knee osteoarthritis

Outcome	The northern Thai version of TSK-17	The Thai version of WOMAC	The Thai version of physical component summary of SF-36 V2	The Thai version of mental component summary of SF-36 V2	TUGT
The northern Thai version of TSK-17	1	0.70***	-0.19	-0.15	0.45**
The Thai version of WOMAC	0.70***	1	-0.24	-0.05	0.40*
The Thai version of physical component summary of SF-36 V2	-0.19	-0.24	1	0.04	-0.10
The Thai version of mental component summary of SF-36 V2	-0.15	-0.05	0.04	1	-0.09
TUGT	0.45**	0.40*	-0.10	-0.09	1

Remark: TSK-17, Tampa scale of kinesiophobia; WOMAC, Western Ontario and McMaster Universities arthritis index; SF-36V2, Short-form survey version 2.0; TUGT, Timed up and go test, \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

The Thai version of WOMAC ( $r = 0.70$ ,  $p < 0.001$ ) had a high correlation with the TSK-17, and the dynamic balance performance test ( $r = 0.45$ ,  $p = 0.001$ ) had a moderate correlation. However, no statistically significant correlation was found between the TSK-17 and the Thai version of the SF-36V2.

#### 4. Discussion

This is the first study to report on the reliability and validity of the northern Thai version of TSK-17 in community-dwelling KOA patients. It had a high overall internal consistency, indicating that it was reliable. Furthermore, the test-retest reliability of the northern Thai version of TSK-17 was high. Furthermore, this questionnaire was highly correlated with the Thai version of WOMAC and moderately correlated with the dynamic balance performance test. The northern Thai version of TSK-17 was simple and uncomplicated, and people with knee osteoarthritis took only five minutes to complete it.

The fear of movement causes people with KOA to avoid physical activity and negatively affects their response to medical treatment (Aykut Selçuk, & Karakoyun, 2020; Levinger, Menz, Wee, Feller, Bartlett, & Bergman, 2011). The northern Thai version of TSK-17 may be a useful tool and could be used to assess the fear of movement in patients with KOA. There was a high level of overall internal consistency ( $\alpha = 0.80$ ). This was consistent with other studies reporting internal consistency of this questionnaire, which has been translated into several languages, such as the Spanish version ( $\alpha = 0.80$ ) (Gómez-Pérez, López-Martínez, & Ruiz-Párraga, 2011), the Italian version ( $\alpha = 0.77$ ) (Monticone, Giorgi, Baiardi, Barbieri, Rocca, & Bonezzi, 2010) and the Chinese version ( $\alpha = 0.88$ ) (Cai, Liu, Woby, Genoosha, Cui, & Guo, 2019). Although the internal consistency of the northern Thai version was lower than that of the standard Thai version ( $\alpha = 0.90$ ) (Areudomwong, & Buttagat, 2017), all questions had a correlation greater than 0.20, as suggested by Roelofs *et al.* (2007). This demonstrated that the translated northern Thai version of this questionnaire was a reliable tool for assessing movement fear in KOA patients.

Test-retest reliability is an important psychometric property of the questionnaire. This study found that test-retest reliability of the northern Thai version of TSK-17 was high

(ICC2,1 = 0.84), which is consistent with that of the standard Thai version of this questionnaire (ICC2,1 = 0.93) (Areudomwong, & Buttagat, 2017). The 7-day interval provided enough time to minimize recall bias while also ensuring that the participants' symptoms were not clinically altered (Brown, Trost, Bauman, Mummery, & Owen, 2004; Marx, Menezes, Horovitz, Jones, & Warren, 2003; Roelofs *et al.*, 2007). As a result, the northern Thai version of the TSK-17 could be used in follow-up assessments of fear of movement.

The convergent validity of the northern Thai version of TSK-17 with other clinical outcomes commonly used in the assessment of KOA patients was investigated in this study. According to the findings, the northern Thai version of TSK-17 had a high correlation with the Thai version of WOMAC ( $r = 0.70$ ), which was consistent with the finding of Areudomwong and Buttagat (2007) ( $r = 0.86$ ). However, our study found that the northern Thai version of TSK-17 and the dynamic balance performance test had moderate validity ( $r = 0.45$ ), contradicting the finding of a previous study that found no statistically significant correlation between the two outcomes (Areudomwong, & Buttagat, 2017).

The Timed up and go test representing dynamic balance performance includes a variety of activities such as standing up from a chair, walking and turning around a cone, and sitting onto a chair from a standing position (Podsiadlo, & Richardson, 1991). Such activities may cause participants to experience knee pain, and participants may fear movement by avoiding weight bearing on the affected knee due to pain. This may result in longer testing times and a statistically significant correlation between the northern Thai version of TSK-17 and the dynamic balance performance test. Other factors that may influence the Timed up and go test, such as pain intensity during the test and lower limb muscle strength, were not measured in this study and should be investigated further. We found no significant correlation between the northern Thai version of TSK-17 and the Thai version of SF-36V2. This could be because the SF-36V2 contains questions that assess respondents' overall quality of life rather than those with KOA who may have physical or mental problems in specific activities.

This study had a few limitations. First, the reliability and validity of the northern Thai version of the TSK-17 in people with KOA were assessed in this study. Future research

should look into the reliability and validity of this questionnaire in other types of knee pain, such as anterior cruciate ligament (ACL) reconstruction and patellofemoral joint syndrome. Second, the responsiveness of the TSK-17 northern Thai version was not evaluated. There was a lack of contextual data on measures of fear of movement over time. As a result, future research should focus on testing the sensitivity and response of the northern Thai version of TSK-17.

## 5. Conclusions

The northern Thai version of TSK-17 produces an easy-to-understand outcome with good reliability and validity, and it can be used as a tool for assessing or screening fear of movement in community-dwelling individuals with KOA.

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