Original Article

Cross-Cultural Adaptation, Reliability, and Construct Validity of the Thai Version of the University of Washington - Concerns About Pain Scale in Individuals with Chronic Low Back Pain

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Background: Pain catastrophizing is an important psychosocial factor that predicts disability and other important pain-related outcomes in individuals with chronic pain. The University of Washington - Concerns about Pain scale (UW-CAP6) is the brief version of a new item bank that assesses pain-related catastrophizing. However, a Thai version of the UW-CAP6 has not yet been developed.

Objective: To 1) cross-culturally adapt the UW-CAP6 items into Thai, using the Functional Assessment of Chronic Illness Therapy translation methodology, and 2) evaluate its measurement properties.

Materials and Methods: Two hundred forty-one patients with chronic low back pain completed the Thai version of UW-CAP6 (T-UW-CAP6), the Thai Fear Avoidance Beliefs Questionnaire (T-FABQ), and the Thai Medical Outcome Study Short-Form 36 (T-SF-36). A subset of 152 participants completed the T-UW-CAP6 again after at least a 7-day interval.

Results: The T-UW-CAP6 had good internal consistency (Cronbach's α=0.89) and moderate test-retest reliability [intraclass correlation coefficient (2, 1)=0.72]. The T-UW-CAP6 was positively correlated with the T-FABQ work and physical activity scales (Spearman's rho=0.38 and 0.39, respectively), and negatively correlated with the social functioning, vitality, and mental health scales of the T-SF-36 (Spearman's rho=–0.54, –0.41, and –0.45, respectively).

Conclusion: The T-UW-CAP6 demonstrated good psychometric properties for assessing pain catastrophizing in Thai individuals with chronic low back pain, supporting the use of the T-UW-CAP6 for clinical and research purposes in this population.

Keywords: Pain catastrophizing, Cross-cultural adaptation, Chronic low back pain, Reliability, Validity

Received 11 Feb 2020 | Revised 24 Apr 2020 | Accepted 27 Apr 2020

J Med Assoc Thai 2020;103(7):658-67
Website: http://www.jmatonline.com

Chronic pain is recognized as a common problem, affecting an estimated 11% to 19% of adults[1,2]. In Thailand, one study reported a 1-month prevalence of chronic pain in nursing staff to be 20%[3]. Chronic pain is also known to have negative effects on general health, psychological functioning, and social and economic well-being[4-6]. The prevalence of chronicity has been found to increase with age, and adults aged between 18 and 39 years may have prevalence rates above 30%[7-9].

Chronic low back pain is the most common chronic pain problem. The annual prevalence of chronic low back pain in the working population has been reported to be between 24% and 61%[10,11]. The number of people with chronic low back pain conditions in low-income and middle-income countries is expected to increase substantially over the next several decades[12]. In Thailand, chronic low back pain affects between 27% and 30% of the adult population annually[13,14]. Chronic low back pain is

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How to cite this article:

Youprasart S, Kanlayanaphotporn R, Janwantanakul P, Jensen MP. Cross-Cultural Adaptation, Reliability, and Construct Validity of the Thai Version of the University of Washington - Concerns About Pain Scale in Individuals with Chronic Low Back Pain. J Med Assoc Thai 2020;103:658-67.

doi.org/10.35755/jmedassocthai.2020.07.10931

the leading cause of decreased work productivity and absenteeism[15-17].

Research evidence confirms the important role of psychological factors such as pain-related beliefs (catastrophizing, fear of movement), affective responses (depression, anxiety), and coping response on the development and maintenance of chronic pain[18-20]. Pain catastrophizing has been defined as "an exaggerated negative mental set brought to bear during actual or anticipated painful experience"[21]. Pain catastrophizing has been shown to be an important predictor for key pain-related outcomes, including pain-intensity, chronicity, disability, and psychosocial and behavioral functioning[5,7,8,22]. Catastrophizing is also a key mechanism used to explain the development of and maintenance of pain in a number of theoretical models, such as the fear-avoidance model of chronic pain[19,23-25].

The two most commonly used measures of catastrophizing in clinical and research settings are the Catastrophizing scale of the Coping Strategies Questionnaire (CSQ)[26] and the 13-item, Pain Catastrophizing Scale (PCS)[21]. The PCS used most of the CSQ Catastrophizing items as a starting point. However, neither the CSQ nor the PCS were developed using modern scale development procedures, which included the creation of item banks and item response theory analyses to select the items that are ultimately retained in the item bank[27]. Item banking also allows users to select any one or more combinations of items from the bank, assess the construct of interest using those items, and create a standardized score (usually a T-score, with a mean of 50 and SD of 10 in the normative population) that can be directly compared with the T-score created from any other combination of items, allowing for greater flexibility in the use of the items (i.e., items can be selected and tailored for a specific population or purpose).

The University of Washington Concerns About Pain scale (UW-CAP) is a recently developed 24-item item bank designed to assess pain-related catastrophizing[22]. The item bank was developed using modern psychometric scale development procedures, comprising 1) the development of a consensus definition of catastrophizing by a panel of world experts, 2) the creation of a large pool of potential items based on that definition, 3) cognitive testing to ensure clarity and understandability of the instructions and items, and 4) item analyses to select the items that meet strict psychometric criteria[22]. The developers created three static short forms consisting of 8, 6, and 2 items from the UW-CAP items (https://uwcorr.washington.edu/measures/uw-cap/). Although the 8-item short form may provide more precision than the 6-item short form, the measure developers also developed static forms with fewer items to give researchers more options, for example, when researchers might require a measure with fewer items due to concerns about assessment burden such as when they are administered a large number of questionnaires in a survey study. A 25% decrease in the number of items used in a large survey can result in a substantial decrease in assessment burden, which can then translate to a larger response rate.

The aim of the current study was to translate a subset of the UW-CAP items into the Thai language, which could be used as in a static short form, and evaluate its psychometric properties in a sample of Thai patients with chronic low back pain to facilitate cross-cultural research on the role of catastrophizing in chronic pain. The authors elected to translate the 6-items short form (i.e., UW-CAP6) over either the 8-item short form or the 2-item short form to balance the need for researchers to have available a measure with few items (to minimize assessment burden) with the need for a measure that has good reliability (given that reliability usually increases as the number of items increase). The authors focused on a sample with chronic low back pain in the present study because chronic low back pain is the most common chronic pain problem, and a great deal of previous research has studied catastrophizing in this population, specifically[28]. The aim was addressed in two phases 1) the cross-cultural translation of the UW-CAP6 into Thai (to create the T-UW-CAP6) using the Functional Assessment of Chronic Illness Therapy (FACIT) translation methodology, and 2) the evaluation of the measurement properties of the T-UW-CAP6. According to the fear-avoidance model of chronic pain, pain catastrophizing is a precursor for pain-related fear, which induces escape mechanisms leading to avoidance behaviors, occupational disability, and negative mood[19,25]. Thus, the authors hypothesized that the convergent validity of the T-UW-CAP6 would be supported if significant correlation coefficients emerged between the T-UW-CAP6 scale score and measures of domains that would be expected to be related to pain catastrophizing, including those assessed by the Fear Avoidance Beliefs Questionnaire (FABQ) and Medical Outcome Study Short-Form 36 (SF-36).

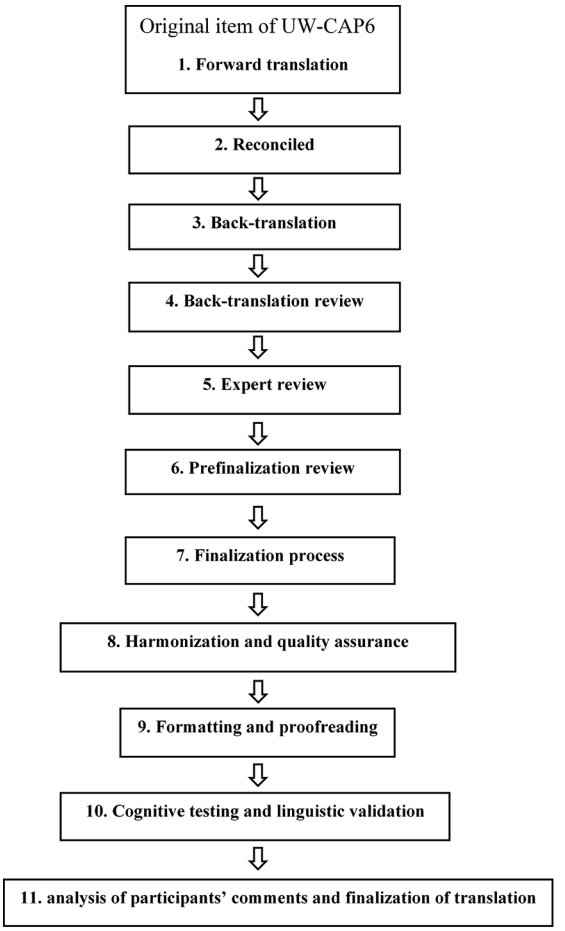

Figure 1. The eleven steps of Functional Assessment of Chronic Illness Therapy (FACIT).

Materials and Methods

Translation procedures

The UW-CAP6 was cross-culturally adapted into a Thai version using the FACIT translation methodology (Figure 1)[29]. There were several reasons making the FACIT translation methodology appropriated for addressing the aims of the present study. First, the FACIT translation methodology emphasizes a universal translation approach. One advantage of the universal translation approach is that there is likely to be less bias when using the same translation across cultural groups than in applying country-specific versions produced by different individuals who tend to introduce stylistic changes that are not necessarily country specific in nature[29]. Second, this methodology is intended to create equality of meaning and measurement in the resulting translated versions, through the use of a specific set of translation procedures[29]. Third, the FACIT methodology is highly detailed and rigorous, with specific procedures used for the step of the process and considered superior in this sense than other translation methodologies[29,30].

Evaluation of psychometric properties of the T-UW-CAP6

Participants: Potential participants were recruited via referrals from physical therapy clinicians working in the outpatient physical therapy departments of three large public hospitals and 1 physical therapy clinic in the Bangkok metropolitan area between August 2018 and February 2019. Inclusion criteria included being a native Thai speaker who could communicate in the Thai language, age 18 years old or older, and having chronic low back pain. The authors used the NIH Task Force on Research Standards for Chronic Low Back Pain criteria for chronic low back pain, which defines chronic low back pain as "a back pain problem that has persisted at least three months and has resulted in pain on at least half the days in the past six months"[31]. The low back region is defined as the space between the lower posterior margin of the rib cage and the horizontal gluteal fold[31]. Exclusion criteria included having a serious medical condition or complication in addition to low back pain that might affect the ability to participate in the study procedures.

Given the present study plans to perform two primary types of analyses to evaluate the validity of the T-UW-CAP6 (i.e., a series of Spearman's rho correlations and a principal components analysis), the authors considered both when determining the sample size that would be needed for the present study. With respect to the planned correlation analyses, and assuming a moderate association (r=0.30), a power of 0.80, and a significance level of 0.05, the authors would need a sample of 85 to detect a significant effect. With respect to the planned principal components, while in general the larger the sample size the better, a sample size of 200 is generally accepted as the minimum needed to provide reliable findings[32]. However, the specific number needed is influenced a great deal by both 1) the level of communality among the variables entered into the analysis, and 2) the number of factors embedded in the data. In the present study, and based on previous research, the authors anticipated that the commonality among the variables would be high and that a single factor would emerge (i.e., representing pain catastrophizing). Under these conditions, given a p (number of items, 6) to f (number of factors, 1) ratio of 6, 19 subjects would be needed to provide valid statistics (i.e., eigenvalues)[32]. Although these power

Table 1. Characteristics of study population (n=241)

Demographic characteristics	n (%)
Sex	
Male	69 (29)
Female	172 (71)
Age (years); mean±SD	46.2±16.9
BMI (kg/m^2); mean±SD	23.9±4.4
Work status	
Have a job	194 (80)
Unemployed	47 (20)
Frequency of low back pain	
Every day or nearly every day in the past 6 months	114 (47)
At least half the days in the past 6 months	127 (53)
Duration of chronic LBP (months); mean±SD	52.3±76.4
Have a medical diagnosis of low back pain?	
Yes	175 (73)
No	66 (27)
Have government sponsored medical insurance?	
Yes	43 (18)
No	198 (82)

SD=standard deviation; BMI=body mass index; LBP=low back pain

analyses indicated at least 85 participants would be adequate for addressing the study questions, the authors chose to recruit at least 200 to ensure more than adequate power in the event that the communality of the T-UW-CAP6 items were less than anticipated or that more than one component emerged in the component analyses.

Three hundred sixty individuals were referred for possible participant and screened for inclusion criteria, 241 (67%) of these met the eligibility criteria and agreed to participate. Descriptive information of the samples is showed in Table 1. As can be seen, the samples consisted mostly of middle-aged females. Their average BMI was at the upper limit of normal ranges for Asians[33]. Their average low back pain duration was 52.3 months.

Measures: The T-UW-CAP6 assesses six catastrophizing responses to pain deemed by the UW-CAP item bank developers to adequately represent the spectrum of catastrophizing responses assessed by the full item bank. Respondents were asked to indicate the frequency which they had the catastrophizing response represented by each item in the past seven days using a 5-point Likert scale, ranging from 1 ("Never") to 5 ("Always"). The total raw score for the T-UW-CAP6 potentially ranged from 6 to 30 (although lower raw scores could potentially be obtained if respondents did not respond to each item). Regardless of the number of items responded to, the raw scores were transformed to a T-score metric, with a mean of 50 and SD of 10 in the original normative sample. Higher scores indicated more catastrophizing.

A Thai version of 16-item FABQ assesses two scales of fear-avoidance beliefs 1) fear-avoidance beliefs about work, and 2) fear-avoidance beliefs about physical activity[34]. This questionnaire was administered to the study participants for evaluating the construct validity of the T-UW-CAP6, given previous research supporting an association between measures of pain catastrophizing and measures of fear avoidance[24,25]. Evidence supports the strong psychometric properties of both the original English version of the FABQ scales[35-37], and the Thai version of the FABQ scales[34,38].

A Thai version of the Medical Outcomes Study Short-Form 36 (T-SF-36)[39] measures the general health status. It has 36 items that assess eight different health status domains of physical functioning, social functioning, role limitations related to physical problems, role limitations related to emotional problems, mental health, vitality, bodily, and general health perception. The SF-36 is a well-known measure with a great deal of research supporting the reliability and validity of its domains[39-42]. The Thai version of this measure has also evidenced strong psychometric properties[39]. Based on literature review, the authors hypothesized that, if valid, the T-UW-CAP6 scale score would be significantly negatively associated with the SF-36 social functioning, vitality, and mental health domain scores, specifically[43-45].

A Thai version of the single-item Global Perceived Effects Scale (T-GPE) was used to identify participants who did and did not experience changes in their pain condition from the initial to the second assessment. The scale asks respondents to indicate the extent of change in their pain condition since a previous assessment on a -5 ("Vastly worse") to 5 ("Completely Recovered") scale. The authors classified individuals who scored from –1 to 1 as reporting no change in their pain condition, to identify participants whose condition had remained the same, with plans to evaluate test-retest stability in these (stable condition) individuals[46].

Procedures: The study participants were asked to complete a general questionnaire that included questions about demographic information (i.e., age, gender, height, weight, pain location, duration of pain, diagnoses, and employment status), and the

Table 2. Mean and the test-retest reliability coefficient of the T-UW-CAP6 scores at the first and second assessments for participants who reported little to no change in their low back condition (n=152)

Scale	1st session Mean±SD	2nd session Mean±SD	ICC (2, 1) (95% CI)	$SEM_{test\text{-}retest}$	$MDC_{95\%}$
T-UW-CAP6	53.4±8.1	51.2±8.0	0.72 (0.62 to 0.78)	4.26	11.81

SD=standard deviation; ICC=intraclass correlation coefficient; CI=confidence interval; SEM=standard error of measurement; MDC=minimal detectable change; T-UW-CAP6=University of Washington - Concerns about Pain scale

T-UW-CAP6 items. To allow for the evaluation of the convergent validity of the T-UW-CAP6, the authors also administered the Thai Fear Avoidance Beliefs Questionnaire (T-FABQ) and the T-SF-36. They were also asked to complete a number of additional measures that had been translated into Thai. The findings from analyses describing the results of the psychometric properties of those other measures will be reported in other papers.

To assess the test-retest reliability of the translated version of the UW-CAP6, the participants were asked to complete the UW-CAP6 items again at least seven days after the initial assessment (n=232). They were also asked to complete a 11-point Global Perceived Effects Scale[46] at the second assessment. The initial and second assessments took 20 and 10 minutes to complete, respectively.

Ethical approval for the present study was obtained from the Office of the Research Ethics Review Committee for Research Involving Human Subjects, Chulalongkorn University (COA no.156/2018). Permission to cross-culturally translate the original English version of the UW-CAP6 into Thai and to validate the adapted version was obtained from the developer of the UW-CAP6. All eligible participants were required to read and sign an informed consent form prior to study participation.

Statistical analysis

The authors first computed descriptive statistics for the demographic and pain history variables to describe the sample. The internal consistency of the T-UW-CAP6 was estimated using Cronbach's alpha (α). A Cronbach's alpha of 0.70 or higher was viewed as indicating adequate internal consistency[47].

Test-retest reliability was evaluated for the T-UW-CAP6 using the intraclass correlation coefficient (ICC)[48]. Only individuals who reported that their pain condition had not changed between the two assessments were used to compute the ICC. An ICC value of 0.75 or greater was viewed as indicating good reliability[49].

Convergent validity was evaluated by computing Spearman's rho correlation coefficients between the T-UW-PAS6 scale scores and the validity criteria variables. All the statistical analyses were conducted using IBM SPSS Statistics software, version 22.0 (IBM Corp., Armonk, NY, USA). Statistical significance was set at the 5% level.

Finally, the authors used exploratory principal component analysis (PCA) to determine the number components embedded in the item pool, using the Scree test to determine the number of underlying components assessed by the measure.

Results

Internal consistency

The Cronbach's alpha of the initial (n=241) and second (n=232) administrations of the T-UW-CAP6 were both 0.89, indicating good internal consistency for the measure in the study samples.

Test-retest reliability

Test-retest reliability analysis was conducted in 152 participants who provided two assessments with at least a 7-day lapse between the assessments and those who rated their pain condition as having no substantial change from the initial to the second assessment (scored from –1 to 1 on the T-GPE). Eighty participants (33%) rated their pain condition as having significant change from the initial to the second assessment (scored less than –1 or greater than 1) and nine participants (4%) did not answer the T-GPE in the second assessment. The mean T-UW-CAP6 score at the initial and second assessments for these individuals were 53.4 (±8.1) and 51.2 (±8.0), respectively ($p<0.01$), suggested that despite reporting no substantial change in their pain condition, a small decrease in catastrophizing as measured by the T-UW-CAP6 occurred (Table 2). However, despite this reduction in the T-UW-CAP6 scores, the measure still evidenced with moderate test-retest reliability with an ICC (2,1) of (0.72)[49]. A mean difference was –2.17 points, with a 95% confidence interval of

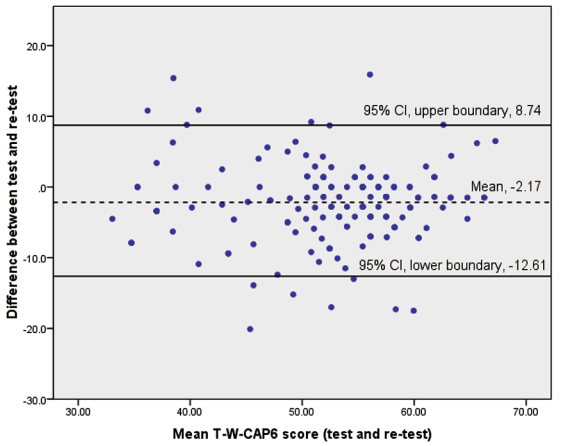

Figure 2. Scatter plot of intraindividual difference between test and re-test against the grand mean of T-UW-CAP6 score (n=152).

8.74 and –12.61 as the limits of agreement between the T-UW-CAP6 scores obtained at the two points in time (Figure 2).

Convergent validity

Significant positive correlations between the T-UW-CAP6 and the FABQ Work (Spearman's rho=0.38, p<0.01), and physical activity (Spearman's rho=0.39, p<0.01) scales were noted. In addition, significant negative correlations were found between the T-UW-CAP6 and the T-SF-36 social functioning (Spearman's rho=–0.54, p<0.01), vitality (Spearman's rho=–0.41, p<0.01), and mental health (Spearman's rho=–0.45, p<0.01) domain.

Exploratory principal component analysis

The eigenvalues from the PCA were 3.98, 0.70, 0.54, 0.34, 0.29, and 0.15. Based on the very substantial decrease from the first to the second eigenvalue (Scree test), the authors concluded that the T-UW-CAP6 items assessed a single underlying component. The component loadings for the six T-UW-CAP6 items are presented in Table 3. As could be seen, all of these were high (range 0.67 to 0.90) and were consistent with the conclusion that the items all assesses a single underlying component.

Table 3. Factor loading for six T-UW-CAP6 items

Item	Factor loading
In the past 7 days, how often did you have the following thought when you were in pain?	
1. My pain is more than I can manage.	0.67
2. Because of my pain, I will never be happy again.	0.81
3. Because of my pain, my life is terrible.	0.90
4. My life will only get worse because of my pain	0.88
In the past 7 days, how often ...?	
5. Did you keep thinking about how much it hurts?	0.78
6. Did you have trouble thinking of anything other than you pain?	0.82

Discussion

The aims of the present study were to translate the UW-CAP6 into Thai using the FACIT translation methodology and to evaluate the psychometric properties of the T-UW-CAP6. During the process of cross-cultural translation and adaptation, none of the items were considered inappropriate for Thai culture, and few items needed to be changed in relation to the original version. The cognitive interviews helped to verify that the instructions and items were understood by the participants. The instrument was easily understood by health care professionals, patients, and their companions. In addition, the findings suggest that the T-UW-CAP6 items assess a single underlying construct, have good internal consistency, moderate test-retest reliability, and construct validity, as shown by significant associations with measures of the validity criterion variables, including the two FABQ scale scores and three T-SF-36 domain scores, when assessed in patients with chronic low back pain recruited from different clinical settings.

The T-UW-CAP6 evidenced good internal consistency, supporting the homogeneity of the score and strong correlations among the items, and between the items and the total score. The present study result is similar to the previous research with other measures of catastrophizing, showing that this domain can be assessed reliably[26,50,51]. The good internal consistency found in the present study and in research on other measures of catastrophizing suggests that respondents generally consider each item carefully and take the time needed to provide a valid response to each question[52].

The test-retest reliability of the T-UW-CAP6 was moderate with an ICC (2, 1) of 0.72. A majority of participants in the present study (73%) were being treated for their low back symptoms during the period of data collection, which may explain, at least in part, the improvement in their pain condition from the initial to the second assessment for a substantial subset of study participants (33%). Previous studies suggested that the ICC values obtained for an outcome

measure are largely dependent on the variance of disease patterns between participants and the time period between the test and retest sessions[53,54]. The finding that the ICC of T-UW-CAP6 is lower than the original version may be due to differences in participant characteristics and the time interval between the test-retest assessment. The original version collected data from individuals with six different pain problems. However, the present study collected data from individuals with chronic low back pain. Second, for the test-retest reliability of UW-CAP6, the second survey was completed within 40 to 80 hours. Here, the second assessment point was at least seven days of the original assessment. The longer the time period between the test-retest, the more likely variance between participants may occur and the lower the ICC value.

The T-UW-CAP6 showed significant associations with fear of movement and three domains of health-related quality of life, supporting the convergent validity of the measure. This is an important advance in the knowledge regarding the UW-CAP6 measure because there is otherwise no currently published evidence regarding this or any other version of the UW-CAP scales. These findings also lend further support to the notion that pain catastrophizing is associated with important pain-related outcomes[21,55-57]. Specifically, previous research had indicated that pain catastrophizing was significantly associated with psychological dysfunction and with the Work scale of FABQ in physical therapy settings[58,59]. The authors also found that the T-UW-CAP6 score was positively associated with the Work scale of FABQ. In the present study, the T-UW-CAP6 scores were found to be negatively associated with the mental health, vitality, and social functioning domain of the SF-36. These findings are consistent with those of Dance et al[43] who found pain catastrophizing contributed unique variance to the prediction of both the Physical Health and Mental Health components of the SF-36.

Given the role that catastrophizing plays in current and future patient function, a valid and reliable Thai language measure of this construct is needed for clinicians in Thailand to assess catastrophizing in their patients to facilitate appropriate referrals (e.g., to treatments that target catastrophizing) as well as to monitor changes in this important clinical variable over time. The availability of this measure is also important for pain researchers in Thailand, who could use it to evaluate the extent to which catastrophizing impacts patient function in patients with chronic pain in Thailand is both similar to, but also perhaps different from, the role that catastrophizing plays in populations of individuals with chronic pain from other countries.

The T-UW-CAP6 scale score has small measurement errors, which makes it suitable for use in daily clinical practice for benchmarking purposes. The T-UW-CAP6 is simple to complete and very brief, making it potentially very useful in different clinical and research settings. Moreover, the T-UW-CAP6 scores are easy to interpret because the item response theory methods result in scores on an interval level expressed on a common metric, as T scores with a mean score of 50 and a SD of 10.

A major strength of the present study is the use of item response theory analyses, which makes it possible to directly compare a T-score created from any combination of items, allowing for greater flexibility in the use of the items (i.e., items can be selected and tailored for a specific population or purpose). However, an important limitation to the current study is that the sample was one of convenience (i.e., individuals referred by clinicians working in hospitals in the Bangkok metropolitan area who were eligible and willing to participate), and was limited to individuals with chronic low back pain who lived in Bangkok, Thailand. Thus, the authors were unable to determine the extent to which the findings generalize to other individuals with low back pain or individuals with low back pain or other chronic pain conditions living outside of Bangkok. Research to study the psychometric properties of the T-UW-CAP6 in other samples of individuals with chronic pain would help to understand the extent to which the findings from the current study would generalize to other populations. It is possible, for example, that some changes in the items may be required for the items to be linguistically valid in individuals living in the rural areas of Thailand.

Conclusion

Despite the study's limitations, the present study was able to cross-culturally adapt the UW-CAP6 into Thai, and that the resulting measure had a good internal consistency and acceptable test-retest reliability. The T-UW-CAP6 scale score was evidence a pattern of associations with measures assessing fear of pain and different health related quality of life in the ways consisted with what would be expected if it was a valid measure of pain-related catastrophizing. Thus, the findings support the T-UW-CAP6 as a brief, efficient, valid, and reliable tool for use in both

clinical treatment and research settings for evaluating pain catastrophizing in Thai individuals with chronic low back pain.

What is already known on this topic?

Pain catastrophizing has been shown to be an important predictor for key pain-related outcomes, including pain-intensity, chronicity, disability, and psychosocial and behavioral functioning. The UW-CAP6 is the brief version of a new item bank that assesses pain-related catastrophizing.

What this study adds?

The UW-CAP6 was cross-culturally adept into Thai by using the Functional Assessment of Chronic Illness Therapy translation methodology. The Thai version of the UW-CAP6 assess a single underlying construct, has good internal consistency, moderate test-retest reliability, and construct validity.

Ethics approval and consent to participate

All participants were informed about the objectives and details of the study and provided informed consent upon agreement to participate. The study was approved by the Chulalongkorn University Human Ethics Committee.

Availability of data and materials

The datasets that support the findings of the present study are available from the corresponding author on reasonable request.

Funding disclosure

This work was funded by the 90th anniversary of Chulalongkorn University (Ratchadaphiseksomphot Endowment).

Conflicts of interest

The authors declare no conflict of interests.

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