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Psychometric examination of the Malay version of the Pain Catastrophising Scale in a Malaysian chronic pain sample

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Abstract

Introduction: The purpose of this study was to examine the psychometric properties of the Malay version of the Pain Catastrophizing Scale (PCS-M).

Methods: The original PCS was translated into Malay using the back-translation method and was administered to 132 outpatients with non-malignant chronic pain.

Results: Confirmatory factor analysis revealed that a 10-item single-factor model had a better fit profile compared to 8 competing models as documented in previous studies. In terms of internal consistency, Cronbach's α value for the PCS-M was 0.93. In terms of predictive validity, the PCS-M explained 47%, 24%, and 22% of the variance in anxiety, depression, and kinesiophobia, respectively.

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Conclusion: Best presented as a unidimensional construct, the 10-item PCS-M demonstrated excellent reliability estimate and initial evidence for predictive validity in a Malaysian chronic pain sample. The 10-item PCS-M is a reliable and valid tool to be used in chronic pain management in the Malaysian context.

Keywords: chronic pain, Malaysia, Pain Catastrophising Scale, psychometric analysis

Introduction

Pain catastrophising has been conceptualized as the exaggeration of a negative mental state during an actual or anticipated pain experience.[1] Individuals engaged in pain catastrophising tend to exaggerate and magnify the potential danger of their pain experience. Pain catastrophizing can be theoretically and operationally defined in 3 ways. Firstly, as a psychological construct, pain catastrophising has gone through rigorous clinical and experimental investigations. Studies have shown consistent associations between pain catastrophizing and a wide range of pain-related outcomes, including pain intensity, pain interference, disability, mood, and social functioning.[2] Secondly, as a process variable in pain management, the assessment of pain catastrophising has become a common practice in both clinical and research contexts.[3] Thirdly, pain catastrophising has been used as one of the outcome indicators to evaluate the effectiveness of cognitive-behavioural-based treatment programs in patients suffering chronic pain.[4]

The 13-item Pain Catastrophising Scale (PCS)[5] is one of the most widely used self-reported questionnaires designed to measure the thoughts and feelings patients may have when experiencing pain. Using first-person statements (*e.g.*, "I keep thinking about how much it hurts"), participants rate items on a 5-point Likert scale ranging from 0 (not at all) to 4 (all the time). The PCS was originally developed in English[5] and has been translated into various languages such as Afrikaans,[6] Catalan,[7] Croatian,[8] Dutch,[9] French,[10] Mandarin,[11] German,[12] Italian,[13] Japanese,[14,15] Korean,[16] Norwegian,[17] Portuguese,[18] and Xhosa,[6] as well as adapted for various informants such as children,[19] parents,[20] and significant others.[21]

In terms of factor structure, the original PCS has a 3-factor model describing Rumination (4 items), Magnification (3 items), and Helplessness (6 items).[5] Sullivan and colleagues obtained these factors via principal component analysis with oblique rotation. Cronbach's alpha values were 0.87 for Rumination, 0.79 for Helplessness, and 0.60 for Magnification. These 3 factors were found to be moderately correlated with each other (correlation coefficients range from 0.3 to 0.5). Since its initial establishment, the 3-factor model has been replicated in different samples (*e.g.*, chronic

non-cancer pain,[16] low back pain,[17] whiplash,[7] and non-clinical[9]). Several studies, however, have failed to replicate the 3-factor model,[11-13, 15, 17] suggesting that the PCS could also be explained by a 2-factor model.[22,23] In view of the variability in factor structure of the PCS, it is suggested that factor structure underlying the PCS might differ by population and sample characteristics.

The present study examines the psychometric properties of the Malay version of the Pain Catastrophizing Scale (PCS-M) in a sample of patients with chronic in Malaysia. Given the extensive data that supports the validity and reliability of the PCS across countries and language, the current study skipped the exploratory processes (*i.e.*, face validity, test-retest reliability, and exploratory factor analysis) and focused on confirmatory analyses. Specifically, we examined the goodness-of-fit of 9 plausible models[5,12,13,15,17,22-24] from existing literature. We also examined the criterion validity of the best-fitting model in predicting depression, anxiety, and kinesiophobia.

Methods

Participants

The present study was part of a larger cross-sectional investigation designed to assess psychological functioning and functional disability in patients with chronic non-cancer pain. Based on subject-to-item ratios of 10:1, we recruited 132 participants (55 males and 77 females) from 2 public pain clinics in Malaysia. Participants ranged in age from 20 to 90 years (M = 48.2, SD = 15.2). Only Malaysian citizens above 18 years old who could comprehend the Malay language and had been experiencing non-cancer pain for more than 3 months were recruited in the present study. Individuals who were pregnant, had a history of terminal illness, or diagnosed with a psychiatric disorder were excluded. The participants self-reported as Malay (48.9%), India (30.1%), Chinese (19.5%), and other (1.5%).

Measures

Sociodemographic information

A sociodemographic questionnaire was used to inquire patient information that included age, sex, marital status, ethnicity, educational level, and employment status.

Translation and validation of the PCS-M

In the present study, translation and validation of the PCS-M involved 4 steps. In step 1, the forward translation from English to Malay was performed by a doctoral student and reviewed by a doctoral-level clinical psychologist. In step 2, the Malay version was then back-translated into English by a third person who is also a doctoral-level clinical psychologist but had less experience in pain management and hence no prior exposure to the PCS. In step 3, the back-translated version was sent to the original author for review and correction. Discussions and clarifications were done via email. The issues being discussed were related to the use of the Malay words "asyik" and "sering" in representing the English word "always". It was decided that the word "asyik" would be more appropriate to represent "always" in the PCS-M items as it is more commonly used to describe a repeated undesirable behaviour in Malay. After making these minor changes, we presented the translation to a clinician and a patient who are both native Malay speakers for comments, before concluding the final version of the PCS-M. In step 4, we examined the psychometric properties of the final version of the PCS-M in a clinical sample.

Malay version of the Hospital Anxiety Depression Scale

The Malay version of the Hospital Anxiety Depression Scale **(**HADS-M) is a 14-item self-reported measure of depression and anxiety in patients of non-psychiatric hospital clinics.[25] The scale has 2 subscales namely HADS-Anxiety (HADS-A-M) and HADS-Depression (HADS-D-M). Participants rate items on a 4-point Likert scale ranging from 0 (not at all) to 3 (most of the time). Higher scores indicate higher level of depression or anxiety. The Cronbach's alpha estimates were 0.85 for the HADS-A-M and 0.75 for the HADS-D-M in the present study.

Malay version of the Tampa Scale for Kinesiophobia

The Malay version of the Tampa Scale for Kinesiophobia (TSK-M) is a 17-item self-reported measure of fear of movement/(re)injury.[26] Participants rate items on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Higher scores generally indicate higher levels of kinesiophobia. The Cronbach's alpha estimate for the TSK-M was 0.72 in the present study.

Procedure

This study was registered under the Malaysian National Medical Research Registration (NMRR). We also received ethical clearance from the Malaysian Medical Research and Ethics Committee (MREC) (registered number: NMRR-14-519-20547). Patients attending the pain clinics in Hospital Kuala Lumpur and Hospital Selayang were invited to participate in the study. Individuals who consented to the study

were invited to complete a set of questionnaires containing the PCS-M, HADS-M, and TSK-M.

Statistical analyses

We performed all statistical analyses with SPSS version 21.0 and Analysis of Moment Structure (AMOS). In examining factor structure, we performed a series of confirmatory factor analyses. The model fit of each factor structure was determined based on several fit indices including: Chi-square to degree of freedom ratio (χ^2/df), Root Means Square Error of Approximation (RMSEA), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Akaike Information Criterion (AIC). These fit indices were accepted as satisfactory when; $\chi^2/df \leq 5.0$, RMSEA ≤ 0.08, AGFI ≥ 0.9, CFI ≥ 0.9, and TLI ≥ 0.9. For AIC, lower scores indicate better model fit.[27] In examining the internal consistency of the PCS-M, we obtained its Cronbach's alpha values. Simple linear regression was performed to establish the predictive validity of the PCS-M in relation to the HADS-M and TSK-M scores.

Results

Confirmatory factor analyses

Table 1 presents the results of a series of confirmatory factor analyses. In addition to the original 13-item single-factor model (Model 1a)[5] and Din *et al.*'s 10-item single factor model (Model 1b),[24] a series of plausible models identified in the previous studies were evaluated:

a. Model 2a: Osman *et al.*'s 13-item 2-factor model[23]
b. Model 2b: Chibnall and Tait's 13-item 2-factor model[22]
c. Model 3a: Fernandes *et al.*'s 13-item 3-factor model[17]
d. Model 3b: Iwaki *et al.*'s 13-item 3-factor model[15]
e. Model 3c: Meyer *et al.*'s 13-item 3-factor model[12]
f. Model 3d: Monticone *et al.*'s 13-item 3-factor model[13]
g. Model 3e: Sullivan *et al.*'s 13-item 3-factor model.[5]

While all the models met the criteria for χ^2/df, CFI, and TLI, only Models 1a and 1b fulfilled the RMSEA requirement. Further examination revealed that Model 1b had a noticeably lower AIC value as compared to Model 1a. Taken together, Model 1b emerged as the most desirable factor structure as reflected by its goodness-of-fit profile: $\chi^2 = 50.29$, $df = 35$, $p < 0.05$; $\chi^2/df = 1.437$; RMSEA = 0.06; AGFI = 0.841; CFI = 0.98; TLI = 0.98; AIC = 90.291 (Fig. 1).

Table 1. Model fit for each factor structure (*N* = 132)

Model	Author (Year)	Items	CMIN/DF	RMSEA	AGFI	CFI	TLI	AIC
1a	Sullivan et al. (1995)	13	1.812**	***0.079***	0.841	***0.953***	***0.942***	169.991
1b	Din et al. (2015)	10	1.437*	***0.058***	0.893	***0.982***	***0.977***	***90.291***
2a	Osman et al. (1997)	7-6	2.158**	0.094	0.805	***0.933***	***0.918***	192.107
2b	Chibnall & Tait (2005)	9-4	2.087**	0.091	0.808	***0.937***	***0.923***	187.582
3a	Fernandes et al. (2012)	5-5-3	2.056**	0.090	0.815	***0.941***	***0.925***	185.486
3b	Iwaki et al. (2012)	5-5-3	1.995**	0.087	0.816	***0.944***	***0.930***	181.676
3c	Meyer et al. (2008)	5-5-3	2.139**	0.093	0.803	***0.936***	***0.919***	190.615
3d	Monticone et al. (2012)	6-5-2	2.017**	0.088	0.814	***0.943***	***0.928***	183.043
3e	Sullivan et al. (1995)	6-3-4	2.116**	0.092	0.805	***0.937***	***0.921***	189.211

CMIN/DF: Chi-square to degree of freedom ratio; RMSEA: Root Means Square Error of Approximation; AGFI: Adjusted Goodness-of-Fit Index; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; AIC: Akaike Information Criterion
Values in ***bold italics*** indicate satisfactory fit.
* p-value for $\chi^2 < 0.05$
** p-value for $\chi^2 < 0.01$

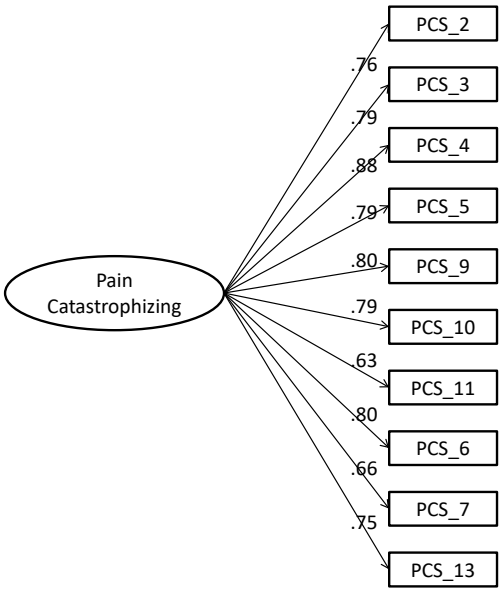

Fig. 1. Factor loadings for Model 1b

Internal consistency

We only reported internal consistency for Model 1b in that its fit profile was superior to other competing models. Cronbach's alpha estimate for the 10-item PCS-M was 0.93 in the present study.

Predictive validity

The 10-item PCS-M was assessed for criterion validity by examining its ability to predict the HADS-A-M, HADS-D-M, and TSK-M scores. As shown in Table 2, the 10-item PCS-M total scores significantly predicted the HADS-A-M scores, β = 0.68, F (1, 130) = 114.284, $p < 0.001$), $R^2 = 0.47$; the HADS-D-M scores, $\beta = 0.49$, F (1, 130) = 39.885, $p < 0.001$, $R^2 = 0.24$; and the TSK-M scores, $\beta = 0.47$, F (1, 129) = 36.386, $p < 0.001$; $R^2 = 0.22$.

Table 2. Linear regression using the PCS-M subscales to predict HADS-A, HADS-D, and TSK

Variable	R ²/ R²	Adj r²/ R²	F	Standardized β	*p*-value
HADS-A (*n* = 132)	0.47	0.46	114.6284		0.001**
PCS-M				0.68	0.001**
HADS-D (*n* = 132)	0.24	0.23	39.885		0.001**
PCS-M				0.49	0.001**
TSK (*n* = 131)	0.22	0.21	36.386		0.001**
PCS-M				0.47	0.001**

PCS-M: Malay version of the Pain Catastrophizing Scale; HADS-A: Hospital Anxiety Depression Scale-Anxiety; HADS-D: Hospital Anxiety Depression Scale-Depression; TSK: Tampa Scale for Kinesiophobia

* $p < 0.05$

** $p < 0.01$

Effects of demographics on the PCS-M total scores

No significant demographic effects on the 10-item PCS-M total scores were reported (Table 3).

Table 3. Characteristics of the study sample and mean comparison on PCS total score

Variable	*n* (%)	Mean (*SD*)	*p*-value
Sex Male Female Total	 55 (41.7) 77 (58.3) 132	 24.35 (13.40) 27.95 (13.93)	0.08
Ethnicity Malay Chinese Indian Others	 64 (48.5) 26 (19.7) 40 (30.3) 2 (1.5)	 25.86 (13.79) 22.08 (14.53) 30.03 (12.77) 30.50 (13.78)	0.13
Employment Working Not working	 65 (49.2) 67 (50.8)	 26.71 (13.83) 26.19 (13.83)	0.72
Marital status Married Single Divorced/Widowed	 100 (75.8) 20 (15.2) 12 (9.1)	 26.51 (14.50) 25.45 (10.17) 27.58 (13.63)	0.91
Education level Primary school Secondary school Diploma Degree No education	 19 (14.4) 67 (50.8) 22 (16.7) 18 (13.6) 6 (4.5)	 28.79 (12.82) 28.10 (13.51) 25.82 (15.43) 19.50 (12.71) 23.67 (13.43)	0.17
Pain duration (months) Minimum Maximum	132	63.05 (63.78) 3 480	
Pain type Neuropathic Nociceptive Mixed neuropathic-nociceptive Visceral	 53 (40.2) 25 (18.9) 43 (32.6) 11 (8.3)	 26.32 (13.13) 28.44 (13.05) 25.28 (15.22) 27.09 (13.88)	0.84
Pain site Head/Face/Mouth Neck/Shoulder/Upper limbs Back/Sacrum/Buttocks/Lower limbs Abdomen/Pelvis/Chest ≥ 2 Major pain sites	 13 (9.8) 36 (27.3) 40 (30.3) 16 (12.1) 27 (20.5)	 26.23 (13.42) 26.33 (13.24) 25.48 (14.17) 27.56 (13.45) 27.48 (13.48)	0.98

Discussion

The purpose of the present study was to examine psychometric information of the PCS in the context of patients with chronic pain in Malaysia for use in both clinical and research settings. We translated the PCS into the Malay language (PCS-M) using established procedures. The PCS-M was administered to patients who received follow-up treatment at 2 public hospitals in Malaysia. While this is not the first study to translate the PCS into the Malaysian context, it is to our knowledge the first to examine the PCS in a sample of patients with chronic pain. Din *et al.*[24] translated and provided psychometric information on their version of the PCS-M. However, their sample consisted of predominantly young, healthy, male adults in the military that may not generalize well to the clinical population with chronic pain.

Based on existing literature, we identified 9 plausible factor-structure models. Our analysis showed that after removal of items 1, 8, and 12, as suggested by Din and colleagues,[24] the 10-item PCS-M was best presented as a unidimensional model. The predictive validity of the PCS-M was demonstrated. In particular, the 10-item PCS-M total scores significantly predicted the HADS-A-M, HADS-D-M, and TSK-M scores. It is worth mentioning that total variance accounted by PCS-M scores on anxiety was larger than on depression and on kinesiophobia. Such findings generally concur with previous studies documenting that pain catastrophising had a higher correlation with anxiety than with depression.[6,11,13,15,16]

With regards to kinesiophobia, previous research[28-31] has shown that PCS and TSK scores generally have a moderate correlation, but findings from studies that compared different pain samples (*e.g.*, acute vs. chronic[31]; low back pain vs. fibromyalgia[32]) suggest that the correlation coefficient can vary noticeably between clinical population. The current study found pain catastrophizing to account for around 20% of the variance in kinesiophobia, hence further supporting the criterion validity of the PCS-M.

Despite the present study being completely independent from the study by Din and colleagues,[24] the findings of both studies concurr that removing items 1, 8, and 12 improved the psychometric properties of PCS-M in the Malaysian population. One plausible explanation is that after translation into the Malay language, there might have a great deal of overlap in item content, thus preventing clear interpretation between item 8 (*i.e.*, “saya rasa tidak sabar-sabar nak kesakitan ini pergi”/“I anxiously want the pain to go away”) and item 11: “saya asyik berfikir tentang betapa saya betul-betul nakkan sakit ini hilang”/“I keep thinking about how badly I want the pain to stop”). It is also plausible that the meaning of certain phrases (*e.g.*, “tidak sabar-sabar” can mean “anxiously” or “looking forward to”) may become ambiguous after translation.

Nevertheless, the original 13 items of the PCS were developed from careful consideration and have been used widely in the existing literature. Removal of the items in the PCS-M may result in the loss of opportunity to perform cross-cultural data comparison. We recommend retaining all 13 items from the original version in the PCS, but researchers adopting the PCS-M should decide whether to analyse the construct based on the 10- or 13-item version according to their study designs. Ideally, studies employing the PCS-M alongside other language versions should be analysed using the 13-item version, while studies that focus solely on Malay-speaking participants may consider analysing the 10-item version.

There are a few ways to provide additional psychometric information on the PCS-M. First, the predictive validity of the PCS-M in this study was assessed using only the HADS-M and TSK-M. Future studies may consider examining predictive validity of the PCS-M using other outcome measures such as pain interference (*e.g.*, Brief Pain Inventory[33]), fear avoidance (*e.g.*, Fear Avoidance Beliefs Questionnaire[34]), and disability (*e.g.*, Roland-Morris Disability Questionnaire[35]). Second, pain catastrophising-related measures such as the Pain-Related Self-Statement[36] can help establish the concurrent validity of the PCS-M. Third, test-retest reliability can be established by administering the PCS-M to the same sample within a time lapse of several hours to days.

Conclusion

Best presented as a unidimensional construct, the 10-item PCS-M demonstrated excellent reliability estimate and initial evidence for predictive validity in a Malaysian sample of patients with chronic pain. Hence, the tool is ready for use to assess pain catastrophizing among chronic pain patients in Malaysia.

Declarations

Ethics approval and consent to participate

This study was registered under the Malaysian National Medical Research Registration (NMRR). We also received ethical clearance from the Malaysian Medical Research and Ethics Committee (MREC) (registered number: NMRR-14-519-20547). Individuals who consented to the study were invited to complete a set of questionnaires containing the PCS-M, HADS-M, and TSK-M.

Competing interests
None to declare.

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