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Cross-cultural adaptation of the Pain Catastrophizing Scale in Greek clinical population

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Background: Catastrophizing is an important psychological construct in mediating the behavioral response toward pain.
Objective: The purpose of this study is to examine the psychometric properties of the Pain Catastrophizing Scale (PCS) in Greek clinical population.
Methods: The scale was administered in 376 patients with chronic cervical and lumbar pain. Test–retest reliability, internal consistency (Cronbach α) and concurrent validity were assessed. Exploratory (EFA) and Confirmatory Factor Analysis (CFA) were used to test the factorial validity of the hypothesized three factor structure.
Results: The PCS factors suggested high levels of test–retest reliability, whereas Cronbachs' α values were acceptable. The EFA yielded a three-factor solution and indicated a marginal fit to the data. CFA procedures indicated a rather acceptable fit to the data. The concurrent validity of the instrument was confirmed.
Conclusion: PCS seems to be a reliable and valid instrument in Greek patients with chronic cervical and lumbar pain.

Keywords: Reliability; validity; chronic musculoskeletal pain; Greek patients.

Introduction

Chronic pain is a subjective and multidimensional phenomenon. Evidence supports the crucial role of psychosocial factors on chronic pain, including beliefs (e.g., catastrophizing), everyday life strategies (e.g., coping), mood (e.g., anxiety), social factors (e.g., social support) and work (e.g., job satisfaction) which may lead to illness as they are the direct expression of an individual response to pain.[1]

Pain catastrophizing is the tendency to magnify the level of threat associated with perceived pain, to feel helpless in the face of pain, and to focus excessively on pain sensations.[2] Catastrophizing could also be an important predictor of cognitive distress, pain-related disability, analgesic use, and dysfunctional adjustment to pain in clinical situations.[3] Also it affects the patients' beliefs system and coping strategies.[4]

As one of the most widely used measures of catastrophic thinking related to pain, the Pain Catastrophizing Scale (PCS) has been shown to be a brief, valid, and reliable tool for assessing pain catastrophizing across different countries and languages. The multidimensional nature of the PCS is also useful for tailoring clinical interventions to the patient's specific profile. PCS has three factors: (a) "Rumination" consists of the inability to inhibit thoughts related to pain, (b) the "Magnification" which is the augmentation of the displeasure of painful situations and (c) a sense of "Helplessness", hopelessness or inability to cope with painful situations.[2] A high score in pain catastrophizing usually leads to increased pain sensitivity, in turn, representing cognitive and emotional processes of the subjective pain experience. Therefore, pain catastrophizing is thought to be reduced in conjunction with many successful treatment interventions.

The purpose of this study is to examine the psychometric properties of the PCS in Greek clinical population. In particular, we investigated: (a) the face and content validity, (b) the factor structure, (c) the concurrent validity, (d) the reliability (internal consistency and test–re-test) of the PCS in Greek population with chronic cervical and lumbar pain.

Methods

The study is in accordance with the principles outlined in the ISPOR task force report "Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures".[5]

Patients

The study population consisted of 376 patients (114 men, 262 women) with a mean age of 45.52 years (SD = 14.18) and with chronic cervical and lumbar pain following spinal stenosis (lumbar or cervical radiculopathy) with a mean duration of 34.35 months (SD = 39.37). Each patient was referred by a physiotherapist to a private physiotherapy clinic and was asked to register with the study. All the patients were over 18 years old with adequate verbal ability and communication. Exclusion criteria from the study were as follows: (a) any significant anatomical abnormalities (e.g., kyphoscoliosis), (b) the presence of any inflammatory or neoplastic lesion (e.g., tumor or metastasis, vertebral fractures, disc herniation requiring surgical treatment) and (c) serious psychiatric disorders (e.g., severe depression, schizophrenia). This study was in accordance with the Ethics principles outlined in the Declaration of Helsinki (Date 3/2019-3/2020). All participants gave their written informed consent before taking part in the study.

Instruments and procedures

Demographics

All patients' demographic and clinical characteristics (e.g., age, gender, etc.) may be referred to Table 1.

Table 1. Demographic and clinical characteristics of patients ($n = 376$).

Demographic characteristics	Frequency f	Relevant frequency (%)
Men	170	45.21
Women	206	54.79
Education		
Elementary	75	19.95
High School-Lyceo	210	55.85
University	91	24.20
Profession		
Private servants	115	30.59
Public servants	94	25
Retired	57	15.16
Housewives	79	21.01
Manual professions	31	8.24
Marital status		
Married	290	77.13
Non married	86	22.87
Visit to physician		
Yes	350	93.10
No	26	6.90
Medication		
Yes	310	82.45
No	66	17.55

Pain Catastrophizing Scale (PCS)

Pain Catastrophizing Scale (PCS) instructions ask participants to reflect on past painful experiences and to indicate the degree to which they experienced each of 13 thoughts or feelings when experiencing pain, on 5-point scales with the end points (0) not at all and (4) all the time. A total score is computed by summing the responses to each item which can range from 0 to 52, with higher scores representing greater use of catastrophic thinking in response to pain. The PCS subscales are computed by summing the responses to the following items: "Rumination" (e.g., "I can't stop thinking about how much it hurts") (8, 9, 10, 11 items), "Magnification" (e.g., "I'm afraid that something serious might happen") (6, 7, 13 items) "Helplessness" (e.g., "There is nothing I can do to reduce the intensity of my pain") (1, 2, 3, 4, 5, 12 items). The PCS can be completed and scored in less than 5 min. The simplicity and usefulness of PCS led to various translations across languages and cultures, for example, Arabic,[6] Afrikaans,[7] Brazilian,[8] Catalan,[9] China,[10,11] Dutch,[12] French,[13] German,[14] Italian,[15] Japan,[16] Korean,[17] Malay,[18] Norwegian,[19] Sinhala,[20] Spanish,[21] Swedish[22] and Turkish.[23]

Short-Form McGill Pain Questionnaire (SF-MPQ)

The Short-Form McGill Pain Questionnaire (SF-MPQ) has been developed for adults.[24] The component of the SF-MPQ consists of 15 descriptors (11 sensory; 4 affective) which are rated on an intensity scale as 0 = none, 1 = mild, 2 = moderate or 3 = severe. The SF-MPQ, also, includes the Present Pain Intensity (PPI) index with 1 item and 1 item for a 10 cm visual analogue scale (VAS) for average pain. SF-MPQ has acceptable psychometric properties and it has been used in several studies of chronic pain, like athletes' knee,[25] neck pain,[26] etc. The SF-MPQ has been translated into many languages, including Arabic,[27] Brazil,[28] Greek,[29] etc. The SF-MPQ takes approximately five minutes to complete and score.

Procedure

First, the PCS was translated from English to Greek by two individuals' specialists in English language with excellent knowledge of it. The translators were given a clear explanation of the concepts in the PCS in order to capture the conceptual meaning of the items. Both of them had PhDs in physiotherapy, taught at a university level, and one of them had experience in questionnaire validation. One of the English translators and the first author compared the translations, reached a consensus and modifications were made as needed, resulting in the penultimate version of the PCS.

A back translation then was done by an independent, bilingual (English and Greek translator), who was unaware of the original English version of the PCS and his mother tongue was English. Afterwards, the first author reviewed these translations and, with the help of the back-translator, ensured that the Greek version reflected the same item content as the original version and was conceptually equivalent.

An expert bilingual committee of two different physiotherapists, one methodologist, and the three translators chaired by the first author explored the semantic, idiomatic, and conceptual equivalence of the items and answers to identify any discrepancies or mistakes. The final Greek version of the instrument derived after the reconciliation report was compiled by the expert committee.

The initial form of the translated PCS was first given to a group of 30 patients with chronic pain to ensure that it can be fully comprehended by a psychologist. It was administered face-to-face and the participants were asked whether they fully understood all items and whether they had problems with the formulation of the questions and/or answers. This group of participants had the same inclusion criteria and clinical characteristics with the sample of the study, i.e., over 18 years old with chronic low back pain, neck pain and or limp pain for at least six months. The first author and the expert committee reviewed the results of the cognitive debriefing with the aim of identifying any modification necessary to improve the Greek form. From this procedure, some minor revisions (i.e., grammatical, syntax changes on difficulty in completing the scale and understanding the text) were made according to patients' suggestions by the first author and the expert committee.

Then, the PCS was completed by 376 patients with chronic pain. The patients were contacted directly by the second author who collected the data and were informed about (a) the purpose of the study, (b) the voluntary participation and (c) the confidentiality of the responses. Patients, who

met the inclusion criteria and were interested in participating in the study, were asked to sign an informed consent document. Also, they complete the demographic questionnaire, the SF-MPQ, VAS and PPI. The completion of these instruments took approximately from 8 to 12 min.

Data analysis

Statistical analyses were performed using the Statistical Package for Social Science (SPSS; Version 14.0). A level of $P < 0.05$ was considered statistically significant. Descriptive statistics are reported using means (M), standard deviations (SD) and frequencies (f) for patients' demographic characteristics. Structural Equation Modeling Software 5.7 b (EQS) for Windows[30] was used to perform Confirmatory Factor Analysis (CFA) to assess the factor structure of the PCS.

Construct validity

An Exploratory Factor Analysis (EFA) was chosen to examine the factor structure of the scale. Maximum likelihood (ML) method with direct oblimin rotation was used to determine if the PCS represented the three factors. The ML method was used as the factor extraction method to examine the factor solution, which best fit the measurement variables.[31] This method provides the means to conduct significance tests and to derive confidence intervals. It examines the possibility that the correlation matrix is derived from a population, in which the structure of the most dominant factor supports certain scoring of answers.[32] It also examines the statistical significance of factor loading and factor correlation.[33]

Five criteria were considered in determining the number of factors rotate: (a) the scree plot test, (b) the eigenvalue-greater-than-one rule, (c) the percentage for variance accounted for by each component, (d) the percentage of total variance accounted for by the retained components and (e) the number of interpretable components.[32,33] Also, specific criteria were employed in order to accept the factor structure of the scale: (a) a factor-loading criterion of 0.40,[34] (b) a statistical significance of each item's factor loading[35] and (c) a criterion of 0.30 for an item's communality.[36]

A Confirmatory Factor Analysis (CFA) was conducted to further examine the factorial validity of two models of the scale (a) the original three-factor model reported by Sullivan *et al.*[2] and (b) the two-factor model reported by Osman *et al.*[37] CFA assumes the multivariate normality of the CPS items; therefore, univariate skewness and univariate kurtosis, and multivariate normality were investigated.[38] Maximum likelihood estimation was used which is the standard method of estimating free parameters in a structural equation method.[31] A number of fit indices were investigated to evaluate the hypothesized model and the two alternative models: (1) Chi-square (χ^2),[39] (2) *Satorra–Bentler* χ^2/df *ratio* or *Q test*,[30,40] (3) *Non-Normed Fit Index* (NNFI),[30,40] (4) *Comparative Fit Index* (CFI),[30,40] (5) *Standardized Root Mean Squared Residual* (SRMR)[41] and (6) *Root Mean Squared Error of Approximation* (RMSEA) and the *90% CI of the RMSEA*.[41]

A non-significant χ^2 index indicates a good fit and a χ^2/df ratio or Q test, which is smaller than 2.00, suggests a very good fit. Bentler[42] reported that values of NNFI and CFI above 0.900 support the model fit. Moreover, close fit is typically defined for SRMR and RMSEA less than 0.050.[43] However, Hu and Bentler[41] recommended the criteria of 0.950 for NNFI and CFI and close to 0.080 and 0.060 for SRMR and RMSEA, respectively. Furthermore, the values of factor loadings of the items above 0.400 were considered indicative of an acceptable model fit. In addition, an average off-diagonal standardized residual smaller than 0.050 reflects a model that fits a data set reasonably well.[30,40]

Concurrent validity

Concurrent validity was used to assess the relationships between PCS scores, SF-MPQ, VAS and PPI intended to examine same constructs (i.e., chronic pain). The measurement of an instrument with the same constructs will indicate high correlations. The concurrent validity was assessed using correlations by Spearman's Rho correlation coefficient among the PCS and the other instruments.

Reliability

Coefficient alpha, item means and variances, inter-item correlations and item-total correlations were examined for the PCS. The Cronbach's a coefficient was accepted when its value was larger than 0.70 according to Tabachnick and Fidell.[34] Intra-class correlation coefficients with a one-week interval were assessed for the PCS.

Results

Table 1 presents the main demographic characteristics of the study's sample. Of the 385 patients approached, 376 patients with a mean age of 45.52 years (SD = 14.18) were eligible to take part in the study and completed the questionnaires. No missing data from the 376 patients were recorded. The participants had chronic cervical pain (45%) and low back pain (55%) with a mean duration of pain of 34.35 months (SD = 39.37, range 6–150 months).

Face and content validity

Regarding the face validity, the translation of the instrument seemed to be valid. It was well accepted by the small group of 30 patients as the psychologist and the two physiotherapists had reported. Regarding the content validity, the expert committee resulted that the instrument was found to include necessary questions for creation of an accurate impression of the degree of pain beliefs.

Construct validity

The results of EFA showed that Bartlett's test of sphericity was significant (1599.281, df 110, $p < 0.000$) and the value of the Kaiser–Meyer–Olkin measure of sampling adequacy (0.83) was high. Therefore, the data were appropriate to be used in a factor analysis.[34] Also, values of univariate skewness (from 1.65 to 0.03) and kurtosis (from 2.18 to 0.05) were lower than the cut-off criteria of two for skewness and seven for kurtosis, which demonstrate the normality of the variables.[38] The EF showed a three-factor solution with eigenvalues from 4.13 to 1.98 which accounted for 76.03% of the total variance (Table 2). The first factor (Helplessness), the second factor (Rumination) and the third factor (Magnification) consisted of six, four and three items, respectively.

Maximal Likelihood (ML) was the factor extraction method which has been used to analyze the factor structure of the PCS. Mardia's coefficient (normalized estimate = 101.620) revealed acceptable multivariate kurtosis among the items. This value is smaller than the cut-off point of 208 [13 items of PCS X (13 items + 3) = 208].[43] The results of CFA showed that the three first-order-factor solution (FM_3) displayed a very good fit [$\chi^2(df54) = 106.970$; $p < 0.001$; NNFI = 0.957; CFI = 0.988) (Table 3). The Satorra–Bentler χ^2/df ratio and the values of SRMR and RMSEA indices suggesting that they are acceptable indexes.

Another alternative model was examined to further test the structure of the PCS. The alternative two-factor model (FM_2) showed a poor fit based on the fit indices. The χ^2/df ratio (χ^2/df ratio = 5.360) was higher than the 3-factor model. The NNFI and CFI did not reach the cut-off

Table 2. Exploratory factor analysis: Factor loadings, communalities, eigenvalues, and percentage of explained variance of the pain catastrophizing scale ($n = 376$).

	Factor loadings			
Pain catastrophizing scale	Factor 1 Helplesssness	Factor 2 Rumination	Factor 3 Magnification	Communalities
Item 1	0.73			0.59
Item 2	0.76			0.57
Item 3	0.79			0.54
Item 4	0.85			0.68
Item 5	0.67			0.46
Item 12	0.66			0.44
Item 8		0.73		0.58
Item 9		0.81		0.62
Item 10		0.82		0.65
Item 11		0.64		0.41
Item 6			0.64	0.46
Item 7			0.58	0.37
Item 13			0.81	0.58
Eigenvalues	4.13	3.13	1.98	
% explained variance	36.21	23.45	16.37	

Table 3. Fit indices of the two measurement models of the PCS ($n = 376$).

Models	χ^2_k	df_κ	$\Delta\chi^2$	Δ_{df}	χ^2/df	NNFI	CFI	SRMR	RMSEA (90% CI)
FM_3	106.970	54	3.106	—	3.011	0.957	0.988	0.056	0.081 (0.073–0.092)
FM_2	253.111	54	113.156	0	5.360	0.757	0.813	0.167	0.130 (0.092–0.126)

Notes: χ^2_k = chi-square statistic for the hypothesized model, df_κ = degrees of freedom for the hypothesized model, $\Delta\chi^2 = \chi^2$ difference, $\Delta_{df} = df$ difference, NNFI = Non-Normed Fit Index, CFI = Comparative Fit Index, SRMR = Standardized Root Mean Squared Residual, RMSEA (90% CI) = Root Mean Squared Error of Approximation (90% Confidence Interval), FM_3 = original three first-order factor model, FM_2 = two first-order factor model.

criterion of 0.900 and the SRMS and RMSEA were higher than the cut-off criteria. Thus, CFA revealed the same structure as in the original version of the scale and indicated a marginal fit to the data. The fit indices of the two measurement models are presented in Table 3.

Concurrent validity

In order to examine the concurrent validity of the PCS, patients completed the SF-MPQ, VAS, and PPI which have acceptable content and concurrent validity and acceptable reliability indexes. The results of the study showed a positive acceptable correlation between the PCS and the other instruments (Table 4). Particularly, the results of the study showed a positive acceptable correlation between total PCS and "Sensory" subscale of SF-MPQ (Spearman's rho = 0.219, $P < 0.05$) and "Affective" subscale of SF-MPQ (Spearman's rho = 0.245, $P < 0.05$). Also, the total PCS was correlated with the VAS (Spearman's rho = 0.211, $P < 0.05$) and the PPI (Spearman's rho = 0.226, $P < 0.05$) (Table 4).

Reliability

Both Cronbach's α internal consistency coefficients and intraclass correlation coefficients (ICCs) for PCS were acceptable. The item means, the item variances, the inter-item correlations, the item-total correlations, and the internal consistency coefficients of the PCS factors are summarized in Table 5. The reliability coefficients for the three factors were high. In particular, the ICC for the total PCS was 0.850 (95% C.I.: $0.816 \leq \text{ICC} \leq 0.870$), for the first factor (Helplessness) was 0.810 (95% C.I.: $0.76 \leq \text{ICC} \leq 0.85$), for the second factor (Rumination) was 0.850 (95% C.I.: $0.831 \leq \text{ICC} \leq 0.876$) and for the third factor (Magnification) was 0.843 (95% C.I.: $0.826 \leq \text{ICC} \leq 0.851$).

Discussion

One of the most widely used specific scales of assessing pain catastrophizing is the PCS which is short, easily comprehended and simple to complete. Our aim was to investigate the reliability and

Table 4. Correlations among the factors of the PCS and SF-MGPQ, VAS and PPI.

	Pain catastrophizing scale			
	Helplessness	Rumination	Magnification	Total PCS
Short Form-McGill Pain Questionnaire				
Sensory Subscale	0.213*	0.127*	0.323	0.219*
Affective Subscale	0.218*	0.321	0.111*	0.245*
Total SF-McGill Pain Questionnaire	0.234*	0.125	0.267*	0.119*
Visual Analogue Scale	0.441*	0.336*	0.278*	0.211*
Present Pain Index	0.367**	0.286*	0.319*	0.226*

Notes: $^{**}p < 0.01$, $^{*}p < 0.05$. Pain Catastrophizing Scale (PCS), Short-Form McGill Pain Questionnaire (SF-MGPQ), Visual Analogue Scale (VAS), Present Pain Index (PPI).

Table 5. Internal consistency indices (mean, minimum value, maximum value) for the pain catastrophizing scale ($n = 376$).

Pain Catastrophizing Scale	Item means (Min–Max)	Item variances (Min–Max)	Inter-item correlations (Min–Max)	Item-total correlations (Min–Max)	Cronbach α
Helplessness	1.768 (1.58–1.976)	0.495 (0.353–0.553)	0.427 (0.362–0.585)	0.832 (0.760–0.997)	0.830
Magnification	1.811 (1.753–1.968)	1.343 (1.265–1.401)	0.804 (0.787–0.906)	0.781 (0.654–0.863)	0.809
Rumination	1.162 (1.061–1.272)	0.478 (0.322–0.506)	0.556 (0.439–0.675)	0.807 (0.796–0.922)	0.854

validity of the PCS in Greek patients with chronic musculoskeletal pain. The findings of this study suggest that the PCS can be a valid, reliable, and useful research or assessment tool for evaluating overall pain catastrophizing to guide case formulation, treatment planning, or process analysis of treatment in pain centers in Greece.

Forward and back translators prepared the Greek scale and a committee produced the final Greek version of the PCS. In this study, both CFA and PCA suggested the same 3-factor structure which obtained an excellent goodness-of-fit with a low RMSEA and a high fitting indexes. Thus, the construct validity of the PCS reports the 3-factor structure of the scale. Similarly, the 3-factor structure remains consistent in the Chinese,[11] English,[45] French,[13] German,[14] Hong Kong,[10] Italian,[15] Korean,[17] Norwegian,[19] Sweden[22] and Turkish versions.[23] However, the EFA of the Arabian version suggested a two-factor structure and the CFA comparing the 2-factor model, Sullivan's original 3-factor model, and a 1-factor model based on the total score all provided adequate fit to the data.[6]

To examine the reliability of the Greek version of the PCS, first, the internal consistency was calculated from 374 patients using Cronbach's α coefficients. The scores measured in the PCS factors were statistically significant ($p < 0.001$) and showed that the translated version is reliable with low standard error of measurement. Particularly, it found high internal consistency for the three factors on the contrast with other studies which found lower Cronbach α value, particularly for "Magnification" factor, probably because of its few items.[12,19,22,46] The reason may reflect differences in how individuals appraise the questions dependent on the diversity of pain situations that individuals historically have encountered and taken into consideration in completing the questionnaire.[22] We reported a high value of Cronbach α in "Magnification" factor like Brazilian Portuguese version (α value of 0.80)[7] probably because both of us used large samples which may indicate that α value may also be a consequence of sample size. The test–retest reliability of the PCS was highly significant (ICC = 0.85), higher than English (ICC = 0.73), German (ICC = 0.80), and Korean (ICC = 0.79) versions, similar to German (ICC = 0.83), Italian (ICC = 0.84), Norwegian versions (ICC = 0.85), and Spanish (ICC = 0.84), but lower than the versions in African (ICC = 0.91), Chinese version (ICC = 0.96), Dutch (ICC = 0.92), and Hong Kong (ICC = 0.97). In conclusion, this study confirms the acceptable reliability of the PCS.

The Greek version of PCS showed moderate correlations with pain. This finding is consistent with previous studies showing a strong correlation between PCS and pain intensity and pain interference[14,17,37,47] and the other adapted versions.[9,10,21] The results confirmed that compared with "Rumination" and "Magnification", "Helplessness" was more highly correlated with pain intensity.

A limitation of this study is the absence of examining any correlation between PCS and the psychological status of our patients. Also, relationships between self-reported beliefs and physical tests were not investigated as only self-administered measures were used. A self-administered scale had possible limitations in clinical application. It is uncertain whether the present findings can be extended to other chronic complaints; thus further analyses of the PCS should be carried out. This study did not evaluate the discriminant validity between clinical chronic pain patients and adult community samples.

In future studies, the evaluation of the consistency of the results in this study across samples should be considered for example, in potentially more specific and/or qualitatively different pain

experience (e.g., peripheral neuropathic pain). The PCS can be used in future studies to further assess catastrophizing as a potential predictor, moderator or mediator in a number of treatments for long-standing pain, both medical and behavioral, such as surgery for low back pain, cognitive behavior therapy (CBT), and physiotherapy.[48] Future studies should also evaluate other aspects of validity (e.g., predictive validity), for example, using longitudinal designs in which baseline levels of catastrophizing are used as predictors of changes in pain symptoms and pain-related functioning over time. Also, given that the questionnaire should be used in clinical evaluations, the questionnaire's sensitivity to change also needs to be investigated systematically. The construct and factorial stability of the PCS needs to be further explored in the community. Lastly, the responsiveness of PCS scores to interventions needs to be evaluated in future studies.

Conclusion

PCS in the Greek language form provided reliable and valid instrument for evaluating Greek patients with chronic musculoskeletal pain based on its satisfactory internal consistency, acceptable test–retest reliability, and verification of the construct by CFA, and the confirmation of anticipated correlations of the PCS to relevant psychometric measures.

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Conflict of Interest

The author declares that there is no conflict of interest related to this article.

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Author Contributions

The author conducted the conception and design of the study. Also the author performed the assessment procedure, analysis, and interpretation of the data, preparation of this paper, revision and approval of the final paper.

References

1. Pincus T, Burton AK, Vogel S, Field AP. A systematic review of psychological factors as predictors of chronicity/disability. Spine 2002;27(5):E109–20.
2. Sullivan MJ, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and validation. Psychol Assess 1995;7:524–32.
3. McCracken LM, Morley S. The psychological flexibility model: A basis for integration and progress in psychological approaches to chronic pain management. J Pain 2014;15:221–34.
4. Eccleston C, Fisher E, Craig L, Duggan GB, Rosser BA, Keogh E. Psychological therapies (Internet-delivered) for the management of chronic pain in adults. Cochrane Database Syst Rev 2014;2: CD010152.
5. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. Value Health 2005;8(2):94–104.
6. Huijer HA, Fares S, French DJ. The development and psychometric validation of an Arabic-language version of the pain catastrophizing scale. Pain Res Manag 2017;2017:1472792.
7. Morris LD, Grimmer-Somers KA, Louw QA, Sullivan, M. Cross cultural adaptation and validation of the South African Pain Catastrophizing Scale (SA-PCS) among patients with fibromyalgia. Health Qual Life Outcomes 2012;10:137.
8. Lopes RA, Dias RC, Queiroz BZ, Rosa NM, Pereira LS, Dias JM, et al. Psychometric properties of the Brazilian version of the pain catastrophizing scale for acute low back pain. Arq Neuro-Psiquiatr 2015;73:436–44.
9. Miro J, Nieto R, Huguet A. The Catalan version of the pain catastrophizing scale: A useful instrument to assess catastrophic thinking in whiplash patients. J Pain 2008;9:397–406.
10. Yap JC, Lau J, Chen PP, Gin T, Wong T, Chan I, et al. Validation of the Chinese pain catastrophizing scale (HK-PCS) in patients with chronic pain. Pain Med 2008;9:186–95.
11. Shen B, Wu B, Abdullah TB, Lian Q, Apkarian AV, Huang L, et al. Translation and validation of simplified Chinese version of the pain catastrophizing scale in chronic pain patients: Education may matter. Mol Pain 2018;14: 1744806918755283.

12. Van Damme S, Crombez G, Bijttebier P, Goubert L, Van Houdenhove B. A confirmatory factor analysis of the pain catastrophizing scale: Invariant factor structure across clinical and non-clinical populations. Pain 2002;96:319–24.
13. Tremblay I, Beaulieu Y, Bernier A, Crombez G, Laliberté S, Thibault P, et al. Pain catastrophizing scale for francophone adolescents: a preliminary validation. Pain Res Manag 2008;13:19–24.
14. Myer K, Sprott H, Mannion AF. Cross-cultural adaptation, reliability, and validity of the German version of the pain catastrophizing scale. J Psychosom Res 2008;64:469–78.
15. Monticone M, Baiardi P, Ferrari S, Foti C, Mugnai R, Pillastrini P, et al. Development of the Italian version of the pain catastrophising scale (PCS-I): cross-cultural adaptation, factor analysis, reliability, validity and sensitivity to change. Qual Life Res 2012;21(6):1045–50.
16. Matsuoka H, Sakano Y. Assessment of cognitive aspect of pain: Development, reliability, and validity of Japanese version of pain catastrophizing scale. Jap J Psychosom Med 2007;47:95–102.
17. Cho S, Kim HY, Lee JH. Validation of the Korean version of the pain catastrophizing scale in patients with chronic non-cancer pain. Qual Life Res 2013;22:1767–72, doi: 10.1007/s11136-012-0308-2.
18. Mohd Din FH, Hoe VC, Chan CK, Muslan MA. Cultural adaptation and psychometric assessment of Pain Catastrophizing Scale among young healthy Malay speaking adults in military settings. Qual Life Res 2015;24(5):1275–80.
19. Fernandes L, Storheim K, Lochting Ida, Grotle M. Cross-cultural adaptation and validation of the Norwegian pain catastrophizing scale in patients with low back pain. BMC Musculoskel Dis 2012;13:111.
20. Pallegama RW, Ariyawardana A, Ranasinghe AW, Sitheeque M, Glaros AG, Dissanayake WP, et al. The Sinhala version of the pain catastrophizing scale: validation and establishment of the factor structure in pain patients and healthy adults. Pain Med 2014;15:1734–42.
21. Garcia Campayo J, Rodero B, Alda M, Sobradiel N, Montero J, Moreno S. Validation of the Spanish version of the pain catastrophizing scale in fibromyalgia. Med Clin (Barc) 2008;131:487–92.
22. Kemani MK, Grimby-Ekman A, Lundgren J, Sullivan M, Lundberg M. Factor structure and internal consistency of a Swedish version of the pain catastrophizing scale. Acta Anaesthesiol Scand 2019;63(2):259–66.
23. Ugurlu M, Ugurlu GK, Erten S, Caykoylu A. Validity of Turkish form of pain catastrophizing scale and modeling of the relationship between pain-related disability with pain intensity, cognitive, and emotional factors. Psychiatry Clin Psychopharm 2017;27(2):189–96.
24. Melzack R. The short-form McGill pain questionnaire. Pain 1987;30(2):191–7.
25. Everhart JS, Chafitz AJ, Harris KM, Schiele SE, Emery CF, Flanigan DC. Pain perception and coping strategies influence early outcomes following knee surgery in athletes. J Sci Med Sport 2020;23 (1):100–4.
26. Sun M, Geng G, Chen J, Ma X, Yan M, Liu X, et al. Acupuncture for chronic neck pain with sensitive points: Study protocol for a multicentre randomized controlled trial. BMJ Open 2019;30:9 (7):e026904.
27. Terkawi AS, Tsang S, Abolkhair A, Alsharif M, Alswiti M, Alsadoun A, et al. Development and validation of Arabic version of the short-form McGill pain questionnaire. Saudi J Anaesth 2017;11(Suppl 1):S2–S10.
28. Ferreira KASL, de Andrade DC, Teixeira MJ. Development and validation of a Brazilian version of the short-form McGill pain questionnaire (SF-MPQ). Pain Manag Nurs 2013;14(4):210–19.
29. Georgoudis G, Oldham JA, Watson PJ. Reliability and sensitivity measures of the Greek version of the short form of the McGill pain questionnaire. Eur J Pain 2001;5:109–118.
30. Bentler PM. EQS Structural Equations Program Manual. Encino, CA: BMDP Multivariate Statistical Software; 1995.
31. Preacher KJ, MacCallum RC. Repairing Tom swift's electric factor analysis machine. Underst Stat 2003;2:13–43.
32. Kahn JH. Factor analysis in counselling psychology research, training, and practice: Principles, advances, and applications. Couns Psychol 2006;34:684–18.
33. Fabrigar LR, Wegener DT, Mac Callum C, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. Psychol Methods 1994;4:272–99.
34. Tabachnick BG, Fidell IS. Using Multivariate Statistics, New York: Harper Collins Publishers, 1996.
35. Morrow JR, Jackson AW. How "significant" is your reliability? Res Quart Exerc Sport 1993;64:352–55.
36. Kline P. An Easy Guide to Factor Analysis. New York: Routledge, 1994.
37. Osman A, Barrios FX, Kopper BA, Hauptmann W, Jones J, O'Neill E. Factor structure, reliability, and validity of the pain catastrophizing scale. J Behav Med 1997;20:589–05.
38. West SG, Finch JF, Curran PJ. Structural equation models with non-normal variables: Problems and remedies. In: Hoyle RH, ed. Structural

Equation Modelling: Concepts, Issues and Applications. Newbury Park, CA: Sage, 1995: 56–75.
39. Bentler PM, Bonett DG. Significance tests and goodness of fit in the analysis of covariance structures. Psychol Bulletin 1980;88:588–06.
40. Byrne BM. Structural Equation Modeling with EQS and EQS/Windows. Basic Concepts, Applications, and Programming. London: Sage, 1984.
41. Hu L, Bentler PM. Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Struct Equat Model 1999;6:1–55.
42. Bentler PM. Comparative fit indexes in structural models. Psychol Bulletin 1990;107:238–46.
43. Steiger JH. Structural model evaluation and modification: An interval estimation approach. Multivar Behav Res 990;25:173–80.
44. Mardia KV. Measures of multivariate skewness and kurtosis with applications. Biometrics 1930;57; 519–30.
45. Osman A, Barrios FX, Gutierrez PM, Kopper BA, Merrifield T, Grittmann L. The pain catastrophizing scale: Further psychometric evaluation with adult samples. J Behav Med 2000;23:351–65.
46. Westman AE, Boersma K, Leppert J, Linton SJ. Fear-avoidance beliefs, catastrophizing, and distress: A longitudinal subgroup analysis on patients with musculoskeletal pain. Clin J Pain 2011;27:567–77.
47. Sullivan MJ, Rodgers WM, Kirsch I. Catastrophizing, depression and expectancies for pain and emotional distress. Pain 2001;91:147–54.
48. Smeets RJEM, Vlaeyen JWS, Kester ADM, Knottnerus JA. Reduction of pain catastrophizing mediates the outcome of both physical and cognitive-behavioral treatment in chronic low back pain. J Pain 2006;7:261–71.