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Validation of the Chinese Pain Catastrophizing Scale (HK-PCS) in Patients with Chronic Pain

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ABSTRACT

Objective. This study was conducted to examine the psychometric properties of a Chinese translation of the Pain Catastrophizing Scale (HK-PCS).

Design/Patients. Patients aged 18–79 years (N = 130) with chronic nonmalignant pain attending an outpatient multidisciplinary pain center in Hong Kong participated in this cross-sectional study.

Method. Subjects completed a set of health-related instruments: HK-PCS, Hospital Anxiety and Depression Scale, Roland Morris Disability Questionnaire, SF-36 Health Survey, and a general demographic questionnaire. Data were analyzed for the distribution, internal consistency, reliability, and construct validity.

Results. A satisfactory internal consistency was found ($\alpha = 0.927$). The item–total correlation coefficients ranged from 0.575 to 0.777. The intraclass correlation coefficient was 0.969 for the total HK-PCS score, 0.956 for helplessness, 0.945 for magnification, and 0.910 for rumination. Confirmatory factor analysis verified a second-order factor structure with the comparative fit index = 1.00, root mean square error of approximation = 0.038, and normed fit index = 0.99 ($\chi^2_{(58)} = 68.84$, $P = 0.16$). Significant correlations were found for pain intensity, disability, anxiety, and depression ($r = 0.223$–0.597, $P < 0.01$). The general health, social function, role emotional, and mental health domains of the SF-36 consistently demonstrated negative association with catastrophizing across all HK-PCS scores ($r = -0.279$ to -0.396, $P < 0.01$). No gender difference was noted for HK-PCS scores ($P > 0.05$), which is contrary to the existing literature.

Conclusion. This study has illustrated satisfactory psychometric properties of the HK-PCS. We provide evidence for the validity and reliability of the HK-PCS as an instrument for measuring pain catastrophizing in the Chinese patient with chronic pain.

Key Words. Chronic Pain; Catastrophizing; Chinese Pain Catastrophizing Scale

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Introduction

Catastrophizing is a significant psychological component in mediating the behavioral response toward pain [1–3]. It has been conceptualized as a belief system, a coping strategy, and an appraisal process in the perception and experience of pain. Pain catastrophizing has been described as an exaggerated negative orientation toward a noxious stimulus [1].

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To better assess catastrophizing about pain, Sullivan et al. developed the Pain Catastrophizing Scale (PCS), which is a 13-item self-report questionnaire consisting of three subscales: rumination, magnification, and helplessness [1]. Catastrophizing in pain is related to physical and emotional health indices, such as pain intensity, pain-related disability, pain-related fear, and psychological distress [4–7]. The reliability, validity, and construct of the PCS have been replicated [2,8], and a validated Dutch translation has been reported [3,9]. The PCS differentiated pain catastrophizing in the community from clinical samples with pain [3,8–10]. Other general applications of this scale have recently been explored in respiratory illness [11] and children [12].

Approximately 10.8% of the Hong Kong population suffers from chronic pain [13]. This is comparable to reports from North America and Europe [14]. There is an increasing evolution toward the inclusion of cognitive behavioral therapy as part of a multidisciplinary approach in the management of this common condition. Systematic reviews support the effectiveness of psychological approaches [15–17]. Changes in pain catastrophizing, beliefs, and coping are associated with improved outcomes [18]. Pain catastrophizing was the best predictor of attrition at 6 months after a pain management program [19]. Furthermore, the initial scores and early treatment changes in the PCS were significant factors in the outcome prediction of a psychologically based rehabilitation program [20].

An instrument to measure pain catastrophizing in Chinese patients with chronic pain will be a clinically useful tool in patient care. A Hong Kong Chinese version of the PCS, originally translated in 1999, reported a satisfactory internal consistency ($\alpha = 0.94$) [21]. Analysis of the construct by exploratory factor found a two-factor structure in patients with chronic low back pain. In the study by Cheng [22], three items which were not loaded onto the respective subscales were deleted to simplify the interpretation of a two-factor structure. However, the existing catastrophizing literature generally reports a three-factor structure as the best-fit model [1–3,9]. Analysis of a second-order three-factor model confirmed that pain catastrophizing was characterized by its three related subscales [8,12]. In addition, the available literature on pain catastrophizing in Hong Kong [21,22] has not investigated the issue of gender differences, despite studies which have shown consistent differences in the tendency for catastrophic thinking among male and female subjects [1,2,12]. In this study, we evaluated the validity of a second-order three-factor structure using a refined Hong Kong Chinese translation. More importantly, the generalizability of the PCS in a heterogenous sample of patients with different medical conditions causing chronic pain was assessed in this study. Gender differences in the PCS and its subscales were also evaluated in our sample of patients with chronic pain.

This study examined the psychometric properties of a Chinese translation of the PCS (HK-PCS). We investigated the internal consistency, test–retest reliability, factor structure, and correlations of the HK-PCS with other relevant psychometric instruments.

Methods

Subjects

Ethics approval was obtained from the Survey & Behavioral Research Ethics Committee of the Chinese University of Hong Kong before commencement of the study. Consecutive patients with chronic nonmalignant pain attending a regional multidisciplinary pain outpatient center in Hong Kong from August 2003 to April 2004 were invited to participate in the study. Participants were required to be of Chinese ethnicity, have pain for a minimum of 3 months' duration, and be literate in both written and verbal Chinese. Exclusion criteria included: the inability to read due to visual impairment, inability to comprehend instructions, and lack of consent for study participation. The sample size was estimated based on recommendations by Nunnally of a ratio of 10 cases for each item to be factor analyzed [23]. The HK-PCS comprised 13 items. Further sample size considerations were based on previous reports of the correlation between the PCS and other psychometric measures for pain disability, pain intensity, and psychological distress ($r = 0.25$–0.45) [2,3,6,13,24]. Using sample size tables by Machin et al. [25], 130 subjects were required if $\alpha = 0.05$ and power = 0.9.

Measures

HK-PCS

Translation Procedure

The PCS was originally translated into Chinese by Cheng in 1999 [22]. The Chinese translation of the PCS was further refined in this study by an independent linguist not involved in the research. The revised version (HK-PCS) was then back translated by a medical professional who was unfa-

miliar with the PCS. The back translation was compared with the original English version for semantic equivalence. A critical review of the HK-PCS was performed by a board of four clinical psychologists who were involved in chronic pain management. Members of the panel were proficient in both English and Chinese. The consistency in content and meaning were assessed, and suggestions to revisions in the translation were made by the expert panel. A discussion was then held between the principal investigator, a member of the expert panel, and the linguist to confer on final refinements to the HK-PCS. The HK-PCS was then field tested in five chronic pain patients attending the pain clinic. No further modifications were required based on the feedback from respondents during the field testing.

Questionnaire Modification

The structure of the questionnaire was changed in the HK-PCS based on the consensus of members involved in the translation process. The sentence "When I am in pain" was repeated at the beginning of all 13 items, rather than stated only once at the beginning of the questionnaire. This modification was carried out to allow a continuity of individual statements in each item and further facilitate the comprehension by subjects of all education levels.

Both Chinese translations contain the original 13 items as set out by Sullivan et al. [1]; however, modifications were made to the wordings of a majority of the items in Cheng's translation [22] except for items 5, 6, and 8. The principle of translation from the English to the Chinese version of the PCS was that the sentences in different language versions should have the same meanings and refer to the same underlying concept. The principle in the refinement of the Chinese wordings was to obtain a better idiomatic and conceptual rather than literal equivalence.

Description and Scoring of the HK-PCS

The questionnaire contained all of the 13 items of the original PCS by Sullivan et al. [1]. In order to administer the HK-PCS, respondents were instructed to rate the frequency with which they experience different pain-related thoughts and feelings on a 5-point scale, with the endpoints 0 = not at all and 4 = all the time. Items were summed to create a total score (items 1–13), rumination score (items 8–11), magnification score (items 6, 7, and 13), and helplessness score (items 1–5 and 12). Numerous investigations have supported the reliability and validity of the PCS in clinical and experimental samples [1,2,8,9].

Other Measures

Chinese versions of the Hospital Anxiety and Depression Scale (HADS), Roland Morris Disability Questionnaire (RMDQ), and SF-36 Health Survey (SF-36) were administered in this study. Participants were also required to complete a General Pain Intake Form, which included the Pain Numeric Rating Scale (NRS), to assess pain severity.

HADS

HADS is a simple self-report measure to detect anxiety and depression conditions. A Chinese translation has been validated locally. The internal consistency was found to be satisfactory, with Cronbach's α ranging from 0.77 to 0.86 for the full scale and its subscales [26].

RMDQ

The RMDQ is a 24-item questionnaire originally designed to assess the degree of functional disability in patients with low back pain. Jenson et al. found satisfactory reliability and validity of the RMDQ to assess the disability profiles among heterogeneous chronic pain samples [27]. A Chinese version has been validated in a multicentre study in Hong Kong, with the internal consistency reported at 0.86 [28].

SF-36

The SF-36 Health Survey measures general health status. There are eight domains in the SF-36: physical function, role limitation due to physical problem, bodily pain, general health, vitality, social functioning, role limitation due to emotional problems, and mental health. A Chinese (Hong Kong) version of the SF-36 has been validated by Lam et al. [29], with an internal consistency ranging from 0.65 to 0.87 for each domain of the SF-36.

General Pain Intake Form

The participant's demographic data, pain severity, duration, and description were recorded in this form. The Pain NRS was utilized in this study to measure the average pain severity over the past 4 weeks. It is an 11-point numeric pain intensity scale anchored at 0 and 10. It is well accepted as a simple measure of pain severity, and has been reported to adequately assess pain intensity in patients with chronic pain [30].

Data Collection

Written informed consent was obtained from all subjects. An experienced research nurse assisted with the explanation of the nature of the study. The participants were required to fill in a set of health-related instruments while waiting for their consultation at the pain clinic. All questionnaires were self-administered. Verification of the completion of all questionnaire items was carried out by the research assistant.

Thirty subjects were recruited to examine the test–retest reliability of the HK-PCS. These participants were requested to fill in the first HK-PCS questionnaire during their attendance at the pain clinic. They were then required to complete a second HK-PCS questionnaire 1 week later at home. The research assistant would remind them by a telephone call 1 week later to fill in the repeat HK-PCS. The completed forms were returned by mail in a stamped self-addressed envelope to the pain clinic.

Data Analysis

Descriptive statistics of the demographic data and psychometric properties were analyzed using SPSS 11.5. The distribution of scores, floor effect (the percentage of subjects with lowest possible score), and ceiling effect (the percentage of subjects with highest possible score) were explored. The skewness, kurtosis, and Kolmogorov-Smirnov one-sample test for normality were reported.

The internal consistency of the HK-PCS was evaluated by Cronbach's α on the subscales and total HK-PCS scores. Item–total correlation coefficients were computed to assess the relevance of each item in the instrument. The kappa (κ) statistic was utilized to examine the test–retest agreement for each item. Recommendations for the interpretation of κ-values for the strength of agreement are: $\kappa \leq 0.20$ (poor), $0.21 \leq \kappa \leq 0.40$ (fair), $0.41 \leq \kappa \leq 0.60$ (moderate), $0.61 \leq \kappa \leq 0.80$ (good), and $0.81 \leq \kappa \leq 1.00$ (excellent) [31]. The test–retest reliability for each subscale and the total score was determined using the intraclass correlation coefficient (ICC) with an acceptable reliability level set at ICC values above 0.90 [31].

Correlation analysis was conducted to examine the relationship between the HK-PCS and HADS, NRS, RMDQ, and SF-36. The Pearson correlation coefficient was used in the analysis of interval data. Nominal data were analyzed using the Eta coefficient as a measure of association. Gender differences in the HK-PCS scores were analyzed using the Student's *t*-test.

Confirmatory factor analysis (CFA) was chosen to analyze the factor structure of the HK-PCS, as theoretical foundations reported in the literature generally supported a three-factor structure of the PCS [1–3,8,9]. In addition, CFA was utilized to investigate whether the established dimensionality and factor-loading pattern fits a sample from a new population, that is, a group of Hong Kong Chinese patients with chronic pain due to various causes. LISREL 8.54 was used to analyze the factor structure of the HK-PCS. Polychoric correlation matrices were processed in the CFA. The weighted least-squares estimation procedure was utilized in a second-order factor structure analysis [32]. Each item was assessed based on the factor correlation and *t*-statistic of the parameter estimate. Absolute *t*-values greater than 1.96 were considered significant at the 0.05 level. These items were retained because they were considered as important to the model. In addition, the criteria for removing items were factor loadings below 0.5 and greater than 1.0. The LISREL output was examined for out-of-range values, such as negative variances or factor correlations greater than 1. These inadmissible results may be caused by high multicollinearity, Heywood cases, outliers, and flaws in the structural equation modeling program. Correlated error parameters were allowed based on modification indices and logical reasoning. For example, many items for each subscale were similarly worded, and measure closely related concepts. The chi-squared significance test is used to determine the degree to which a proposed model fits the data. Nonsignificant chi-squared values indicated that the proposed model fits the data. However, the chi-squared statistic is easily affected by large sample sizes. Consequently, it is recommended that multiple additional criteria be used to evaluate the goodness of fit of a model. The root mean square error of approximation (RMSEA) is a measure of the discrepancy per degree of freedom in the model. The normed fit index (NFI) measures the proportionate reduction in the chi-squared values when moving from baseline to the hypothesized model. The comparative fit index (CFI) assesses the relative fit of the hypothesized model to a baseline model. The goodness-of-fit index (GFI) expresses the relative amount of the variance and covariance accounted for by the model. RMSEA values <0.05 indicate close approximation, and 90% CI RMSEA

Table 1 Mean (standard deviation), median (range), floor and ceiling effects, and tests of normality of distribution (N = 130)

	Mean (SD)	Median (Range)	Ceiling Effect (%)	Floor Effect (%)	Skewness	Kurtosis	Kolmogorov-Smirnov (*P* value)
Helplessness	15.99 (5.51)	16 (0–24)	0.8	11.5	–0.524	–0.019	0.167
Magnification	7.01 (3.35)	7 (0–12)	3.8	10.8	–0.279	–0.804	0.093
Rumination	10.91 (4.06)	12 (0–16)	0.8	16.9	–0.719	–0.089	0.016*
Total HK-PCS	29.06 (5.51)	31 (0–52)	0.8	0.8	–0.642	–0.028	0.368

* Significant at $P < 0.05$.
HK-PCS = Chinese translation of the Pain Catastrophizing Scale.

values <0.08 suggest a reasonable fit. NFI, CFI, and GFI values >0.90 are judged as a good fit [33].

Results

Subject Characteristics

A total of 189 consecutive patients were invited to participate in the study, of whom 26 declined consent and 33 were ineligible due to illiteracy or visual impairment. The final response rate was 68.78% (N = 130). The median duration of pain experienced by patients approximated 2 years. The average pain intensity was rated as 6 out of a possible score from 0 to 10 of the NRS. The study sample consisted of 41.5% male and 58.5% female patients. The majority (74.5%) of patients received education at a secondary school or tertiary education level.

Distribution of the HK-PCS Scores

There were no missing data. The distributions of scores were shown in Table 1. The scores ranged from the minimum to the maximum for all 13 items. There was minimal ceiling effect of the highest score possible in the HK-PCS subscales and total score. The floor effect for the lowest score possible was 0.8% for the total HK-PCS score and 16.9% for rumination.

The mean scores of the total HK-PCS and its subscales were similar to their medians. Skewness ranged from –0.279 to –0.719, indicating a slight clustering of scores at the high end. Kurtosis ranged from –0.019 to –0.804. The nonsignificant Kolmogorov-Smirnov statistics suggested a normality of the distribution of scores, with the exception of the rumination subscale. Normality of the scores facilitated parametric statistical analysis to be implemented in this study.

Reliability

Examination of the internal consistency showed that the corresponding Cronbach's α values for helplessness, magnification, rumination, and the total HK-PCS score were 0.839, 0.768, 0.809, and 0.927, respectively. All values for alpha if an item was deleted scored below the total HK-PCS Cronbach's α of 0.927. The item–total correlation coefficients ranged from 0.575 to 0.777. With regard to the test–retest reliability, the HK-PCS scores demonstrated ICC which ranged from 0.910–0.969. The ICC (95% CI) was 0.956 (0.912, 0.988) for helplessness, 0.945 (0.889, 0.973) for magnification, 0.910 (0.824, 0.956) for rumination, and 0.969 (0.938, 0.985) for HK-PCS. The kappa statistic was lowest for Question 5 at 0.315 (Table 2).

Factor Structure

The *t*-values revealed all items to be both reasonable and statistically significant. All items were significantly related to their specified factors, verifying the hypothesized relationships among the items and latent factors. A second-order three-factor model of pain catastrophizing with magni-

Table 2 Cronbach's α, alpha if Item deleted, item–total correlations, and kappa (κ) values (N = 130)

	α	Alpha if Item Deleted	Corrected Item–Total Correlation	κ (SE)
Helplessness	0.839			
Item 1		0.923	0.627	0.463 (0.117)
Item 2		0.924	0.609	0.557 (0.116)
Item 3		0.923	0.632	0.605 (0.113)
Item 4		0.920	0.730	0.535 (0.108)
Item 5		0.919	0.754	0.315 (0.125)
Item 12		0.925	0.575	0.468 (0.121)
Magnification	0.768			
Item 6		0.919	0.744	0.687 (0.104)
Item 7		0.921	0.681	0.582 (0.104)
Item 13		0.922	0.665	0.492 (0.121)
Rumination	0.809			
Item 8		0.922	0.660	0.508 (0.117)
Item 9		0.918	0.757	0.518 (0.113)
Item 10		0.918	0.777	0.404 (0.117)
Item 11		0.924	0.588	0.444 (0.116)
Total HK-PCS	0.927			

HK-PCS = Chinese translation of the Pain Catastrophizing Scale.

fication, rumination, and helpless as latent factors was hypothesized. Error variances for items were allowed to covary. Figure 1 shows the LISREL path diagram as well as factor loadings generated for the hypothesized model. Our analysis show a consistency in an adequate model fit by all of the goodness-of-fit measures: CFI = 1.00, RMSEA = 0.038 (90% CI 0.0, 0.069), NFI = 0.99, and GFI = 0.99 ($\chi^2_{(58)} = 68.84$, $P = 0.16$).

Correlations Between the HK-PCS and Relevant Measures

Moderate and significant correlations were generally found with pain intensity, disability, anxiety, and depression ($r = 0.223$–0.597, $P < 0.01$). The general health, social function, role emotional, and mental health domains of the SF-36 consistently demonstrated negative association with catastrophizing across all HK-PCS scores ($r = -0.279$ to -0.396, $P < 0.01$). Nonsignificant correlations were noted for demographic factors such as age, gender, marital status, and education class (Table 3).

The results of gender difference analysis for the HK-PCS total score and its subscales were presented in Table 4. Results of the unpaired *t*-test did not show any significant difference between the HK-PCS scores and gender ($P > 0.05$).

Discussion

This article describes the psychometric properties of an instrument (HK-PCS) to assess pain catastrophizing in a Hong Kong Chinese sample with benign chronic pain. Our results indicate that the HK-PCS is a valid and reliable Chinese translation of the PCS. This judgment was based on its satisfactory internal consistency, acceptable test–retest reliability, verification of the construct by CFA, and the confirmation of anticipated correlations of the HK-PCS to relevant psychometric and demographic measures.

CFA of the HK-PCS verified a second-order three-factor model with helplessness, magnification, and rumination as three underlying dimensions of pain catastrophizing. Consistency in the

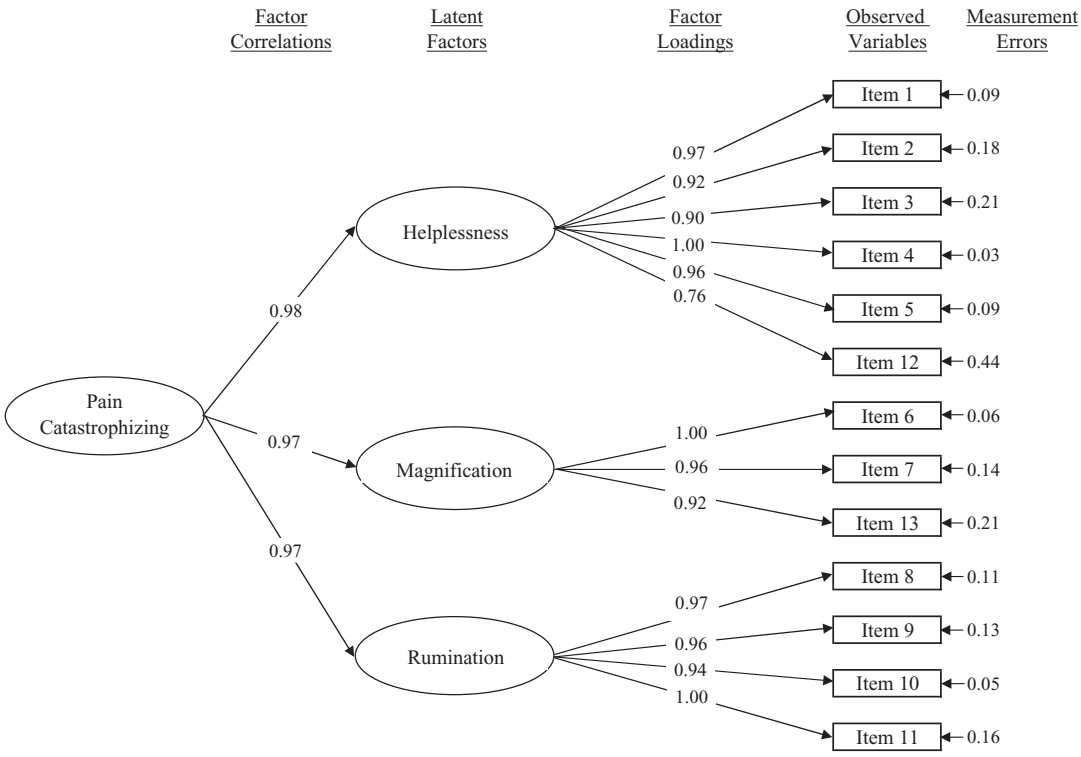

Figure 1 Second-order three-factor model of the HK-PCS with standardized parameter estimates. Confirmatory factor analysis with parameter estimates for the error variances allowed to covary were: Items 7 & 9 = 0.07, Items 8 & 9 = 0.048, Items 11 & 12 = 0.13, Items 12 & 13 = 0.16. A second-order three-factor model was confirmed by the following measures: $\chi^2 = 68.84$ ($P = 0.16$), normed fit index = 0.99, comparative fit index = 1.00, goodness-of-fit index = 0.99, root mean square error of approximation = 0.038. HK-PCS = Chinese translation of the Pain Catastrophizing Scale.

Table 3 Correlations between HK-PCS scores to demographic variables, pain intensity, physical disability, mood, and health status (N = 130)

	Helplessness	Magnification	Rumination	HK-PCS
Demographic factors				
Gender*	0.002	0.124	0.095	0.097
Marital status*	0.084	0.101	0.126	–0.016
Education*	0.226	0.224	0.247	0.248
Age	–0.006	0.035	–0.041	–0.026
Pain duration	0.260†	0.109	0.179	0.164
Other measures				
Pain intensity (NRS)	0.445†	0.334†	0.292†	0.337†
Disability (RMDQ)	0.260†	0.246†	0.186	0.223†
Mood (HADS)				
Anxiety	0.580†	0.543†	0.585†	0.597†
Depression	0.386†	0.395†	0.386†	0.403†
Health status (SF-36)				
Physical function	–0.258†	–0.183	–0.122	–0.156
Role physical	–0.246†	–0.210	–0.123	–0.154
Bodily pain	–0.163	–0.236†	–0.321†	–0.202
General health	–0.339†	–0.279†	–0.316†	–0.340†
Vitality	–0.279†	–0.153	–0.218	–0.203
Social function	–0.362†	–0.330†	–0.303†	–0.332†
Role emotional	–0.310†	–0.298†	–0.308†	–0.325†
Mental health	–0.390†	–0.365†	–0.358†	–0.396†

* Eta coefficient calculated in analysis.
† Correlation is significant at $P < 0.01$ (two-tailed).
HADS = Hospital Anxiety and Depression Scale; HK-PCS = Chinese translation of the Pain Catastrophizing Scale; NRS = Numeric Rating Scale; RMDQ = Roland Morris Disability Questionnaire.

outcomes of different goodness-of-fit measures suggested an adequate model fit, reflecting the fact that the Chinese translation of the HK-PCS preserved the structure of the PCS. In the original Chinese translation of the PCS, a two-factor structure was found, labeled as "helplessness" and a combination of "rumination and magnification" [22]. In this study, modifications were made to the wordings of all items of the original Chinese translation with the exception of three items. The refined Chinese translation of the HK-PCS provides support for the factor structure reported in the adult population [1–3,8,9] and in children [12].

Our findings confirm previous reports of the association between the PCS and other psychometric measures for pain disability, pain intensity, and psychological distress [2,3,6,24]. The HK-PCS scores were consistently and negatively correlated to the general health, social function, mental health, and role emotional domains of the SF-36 in this study. Our results reflect Severeijns et al.'s study [10], which reported that pain catastrophizing moderately contributed a unique variance to the prediction of general health, social function, mental health, and vitality using the RAND 36-item Health Survey 1.0, a questionnaire similar to the Dutch translation of the SF-36.

A moderate agreement was found between the items of the HK-PCS. This may partially be explained by the different conditions administered during the first and second tests. The first HK-PCS questionnaire was filled in by patients while waiting for a consultation at the pain clinic. Repeat administration was carried out 1 week later at home to avoid the inconvenience of study participants having to re-attend the pain clinic. After examining the data, it appeared that the second

Table 4 Mean, standard deviation, and 95% confidence intervals of HK-PCS scores for men and women (N = 130)

	Men (N = 54)		Women (N = 76)		
	Mean (SD)	95% CI	Mean (SD)	95% CI	*P* value
Helplessness	15.98 (5.06)	14.60, 17.36	16.00 (5.84)	14.66, 17.34	0.985
Magnification	7.50 (3.11)	6.65, 8.35	6.66 (3.49)	5.86, 7.46	0.159
Rumination	11.37 (3.79)	10.34, 12.41	10.59 (4.24)	9.62, 11.56	0.284
Total HK-PCS	30.33 (10.20)	27.55, 33.12	28.16 (11.61)	25.51, 30.81	0.270

HK-PCS = Chinese translation of the Pain Catastrophizing Scale.

HK-PCS results were shown to systematically have better responses than the first HK-PCS scores. It was possible that there was a systematic bias with patients scoring better after the clinic consultation, which could be considered as a therapeutic intervention. We recommend that similar environmental conditions and the limitation of interventions be implemented when evaluating the test–retest reliability.

Gender differences and pain catastrophizing in Chinese chronic pain subjects have not previously been reported. Analysis of gender differences in the HK-PCS subscales and the total score did not reveal any significant differences in our sample of heterogeneous chronic pain patients. Our finding was contrary to the existing literature which generally provides support that the female gender displays a higher tendency for catastrophic thinking than their male counterpart [5]. Numerous studies have indicated that women reported higher scores than men in the total PCS scores, and its subscales rumination and helplessness, with no significant differences presented for magnification [1,2,7,8]. One exception to these findings has so far been reported by Osman et al. [2] in study III, where men showed an increased disposition for catastrophic thinking in all dimensions of the PCS. However, Unruh et al. [34] and Harkapaa [35] have reported findings similar to our study, in that no gender differences in catastrophizing were found. Unruh et al. [34] partially attributed lack of gender influence to the differences in the health measurement scales of catastrophizing, and it was proposed that threat appraisal may also have been a mediator between gender and catastrophizing.

In general, the explanation for gender differences in pain catastrophizing has been proposed to be partially attributed to psycho-social factors. Van Damme et al. [9] and D'Eon et al. [36] have established that the PCS is gender invariant, which implies that gender differences are not due to errors in the measurement or structural model. Sullivan et al. [37] hypothesized that catastrophizing had a role in mediating the relationship between gender and the coping response toward pain. It is possible that pain catastrophizing may manifest as a communicative function of a coping strategy [37]. In addition, it was reported by Thorn et al. [38] that gender differences in catastrophizing were partially accounted for by the dispositional tendency to describe oneself as emotionally vulnerable. The influence of sociocultural factors on the impact of gender on emotional and behavioral responses to pain has previously been reported and discussed by Unruh [39]. Ray-Mazumder [40] had also reported that cultural factors and language barriers may influence gender differences in attitudes and health behavior in Chinese Americans. We hypothesize that the absence of gender differences in our sample of Chinese subjects may be mediated by cultural influences in addition to psychosocial factors, although this issue will need to be clarified in future studies.

Several limitations should be taken into consideration when evaluating this article. First, selection bias was possible because the patients from our regional multidisciplinary pain center consisted of more complex chronic pain cases referred by other medical and surgical specialties. It is uncertain whether these findings can be extrapolated to chronic pain patients from different settings, such as patients under the care of the family physician. Second, the HK-PCS was a self-administered questionnaire, which had possible limitations in clinical application. An interviewer-based questionnaire would facilitate the recruitment of a more diverse group of subjects. Third, the HK-PCS should ideally be validated with a "gold standard" measure of catastrophizing. However, no other measure of catastrophizing has been published in the Chinese language to be utilized as a criterion. Finally, this study did not evaluate the discriminant validity between clinical chronic pain patients and adult community samples. The construct and factorial stability of the HK-PCS need to be further explored in the community and different clinical samples in the Hong Kong Chinese population.

This study provides evidence for the validity and reliability of the HK-PCS. Our results have demonstrated that the psychometric properties of the HK-PCS were satisfactory. The HK-PCS can be applied as an instrument for measuring pain catastrophizing in the Chinese patient with chronic pain.

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