# ~~The validity~~Preliminary psychometric properties of the Chinese version of the Chronic Pain Coping Inventory (ChCPCI) in a Hong Kong Chinese population.

**Abstract**

The Chronic Pain Coping Inventory (CPCI) is ~~one of the most~~a frequently employed measure~~s~~ ~~for~~ that assesses~~ing~~ ~~8~~ eight types of coping strategies patients might use ~~to cope~~when faced with chronic pain. Despite its good psychometric properties and widespread use, the instrument has not been tested for its applicability and reproducibility in non-Western populations, such as among Chinese. This study examined the Chinese translation of the 42-item CPCI (ChCPCI-42) in a Chinese chronic pain sample (n = 208). In addition to ChCPCI-42, the patients were assessed on the Chronic Pain Grade (CPG), the Pain Catastrophizing Scale (PCS), the Centre for Epidemiological Studies --- depression Scale (CES-D), and socio-demographic characteristics. Results of confirmatory factor analyses ~~confirmed~~ revealed ~~the factorial validity of~~that, of the ChCPCI-42's ~~, with~~ 8 subscales, 5 ~~5 subscales~~ demonstrated~~ing~~ acceptable-to-good data-model fit (CFI ≥ 0.90) and 3 ~~3 subscales~~ demonstrated~~ing~~ medium fit (CFI: ≥ 0.848). The 8 subscales demonstrated good internal consistency (Cronbach's αs: 0.686 – 0.789) and correlated with CES-D, PCS, pain intensity, and disability in the expected directions. Results of hierarchical multiple regression analyses showed the ChCPCI-42 subscales predicted concurrent depression ($F(8,177) = 3.07$, $p < 0.01$) and pain disability ($F(1, 179) = 4.35$, $p < 0.001$) scores, ~~with~~ the Task Persistence subscale being the strongest predictor ~~among~~ of the 8 subscales. These findings ~~offered~~ support ~~for~~ the factorial validity and reliability of CPCI to be used among Chinese chronic pain patients.

**(word count: 222)**

## 1. Introduction

The Chronic Pain Coping Inventory (CPCI) [1] wais one of the widely used measures designed to assess behavioral and cognitive pain coping strategies. The initial pool of 103 items was written to assess 14 different coping strategies which could be grouped into three board categories: (1) illness-focused, (2) wellness-focused, and (3) neither. The items were examined usingAmong a sample of 176 chronic pain patients. iResults of initial analyses showed suggested that of 103 items written to assess coping strategies grouped as: (1) illness-focused, (2) wellness-focused, and (3) neither, illness-focused coping strategies were associated with greater psychological distress and lower activity, whereas wellness-focused coping strategies were associated with lower psychological distress. After removing individual items with low correlation with the parent scale ($r$<0.40) and subscales with low internal consistency and test-retest reliability ($\alpha$<0.70), the 103 items were reduced to 57 items distributingE across eight subscales: , including Guarding, Resting, Asking for Assistance, Relaxation, Task Persistence, Exercise/Stretch, Coping Self-Statement, and Seeking Social Support, based on. The instrument was then subject to further analyses in a separate sample of 78 chronic pain patients with 7 items added to the Resting and Seeking Social Support subscales (i.e., 64 remaining items) were subsequently administered to. Results of the subsequent analyses 78 chronic pain patients yielded yielding Cronbach alphas ≥0.74, suggesting goodgood internal consistency on the eight subscales ($\alpha$s≥0.74). The inter-rater agreement between patients' own rating and the rating by and their significant others proxy was high on the Guarding, Resting, and Seeking Social Support subscales ($r$≥0.41). Illness-focused strategies were associated with poor adjustment.

The 64-item CPCI (CPCI-64) was later validated inadminstered to 210 Canadian chronic pain patients [2]. Results of pPrincipal component analyses yielded a 8-factor solution broadly which generally supportconsistent withed the original CPCI subscales structure [1]. CPCI-64 cThe study also found that that the coping constructs as assessed by CPCI-64 were conceptually different from another coping measure,those of the Coping Strategies Questionnaire (CSQ) [3], and some CPCI-64 subscales, such as Asking for Assistance, independently associated with pain adjustment. In a sSimilarly elsewhere study that compared CCPI-64 with CSQ, it was found that CPCI-64 subscales were more strongly associated with disability than the were CSQ subscales [4]. The 8-factor structure of CPCI-64 received was further supported in a sample of 210 chronic non-cancer pain using confirmatory factor analysis (CFA) [5].

The instrument remains lengthy though. To reduce assessment burden, a, 42-item version of the CPCI (CPCI-42 ~~attempts have been made to develop shortened version of CPCI. Romano et al.~~ [6] ~~evaluated a shortened, 42-item version of CPCI (CPCI-42) in~~ administered to 154 chronic pain patients~~.~~ ~~The results of~~ showed that the~~t tests comparing~~ CPCI-64 and CPCI-42 evidenced ~~the~~ responsiveness to change from pretreatment to post-treatment for both versions. The high correlations between the two versions (*r*s≥0.91) suggested ~~both versions~~they measured similar constructs. All CPCI-42 scales demonstrated ~~adequate~~ moderate to ~~excellent~~ good internal consistency (Cronbach's αs≥0.70). These findings ~~offered support for~~suggest that the CPCI-42 i~~a~~s a reliable and valid measure of pain coping strategies. The validity of the one- and two-item versions of CPCI subscales was also evidenced [7].

Finally, ~~the predictive validity was assessed~~ among 321 workers with low back pain ~~in a~~followed for 6-months ~~follow-up study [8]. Results of~~ hierarchical regression analyses indicated that the CPCI Guarding subscale predicted both baseline and follow-up disability. Both CPCI Guarding subscale and CSQ catastrophizing subscales predicted baseline pain intensity and ~~depressed~~ mood. [8]

The ~~above review showed that~~ CPCI ~~was found to~~thus appears to ~~be reliable,~~ possess~~ing~~ good ~~construct and predictive validity~~psychometric properties. Yet, ~~the extent to which the CPCI could be extended to~~its utility in non-Western pain populations ~~was unclear~~remains in question. ~~In light of this~~Consequently, the present study ~~aimed to~~ examined the factor structure and psychometric properties of the Chinese version of CPCI-42 ~~in a sample of~~among Chinese chronic pain patients. Validation of the CPCI in Chinese context would inform cross-cultural perspectives of pain coping strategies among Chinese patients with pain problems worldwide. While exploratory factor analyses (EFA) is primarily utilized for identifying underlying dimensions of a measuring instrument without a priori constraints on the estimation of factors or the number of factors to be extracted, CFA ~~is designed to~~ evaluates whether a dataset can be explained by a postulated model. Given that the CPCI-42 ~~is a fully~~has been developed ~~instrument~~ with ~~known~~ a specified factor structure~~s and validity~~, we adopted ~~a~~ CFA ~~approach~~ to evaluate if the CPCI-42 factor structure~~s~~ reported for Western samples ~~are~~ is replicated in a Chinese sample.

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## 2. Method

### 2.1. Subjects

Following ethics approval, patients with chronic musculoskeletal pain were recruited from an orthopedics specialist out-patient clinic ~~in~~ of a Hong Kong public hospital ~~in Hong Kong~~. Patients were invited to participate in the present study during visits for clinical consultations with doctors. Patients were eligible for study participation if they met the following criteria: (1) 18 or above years of age, (2) native Cantonese speakers, (3) having no communication problems or physical conditions that will prevent the completion of the interview, (4) no confusion or cogitive impairment diagnosis from medical record, and (5) willing to participate in the study. All eligible patients gave informed consent and were interviewed while they were waiting for medical consultation.

A total of 208 patients completed the interview. The mean age of the sample was 40.95 (SD=11.28) years and 54.3% ~~was~~ were ~~women~~female. About 47% of the patients reported monthly household incomes of <HK$15,000[*] and 55.9% were married or cohabited. Over half (53.4%) of the sample attained secondary education and 12.1% attained tertiary education. While 53.4% ~~self~~-reported ~~having~~ no particular religious belief~~on~~, 28.2% endorsed Buddhism, Daosim or ancestor worship as religion. About 53% of the patients had full-time employment whereas unemployed and housewives constituted 16.5% and 11.7% of the sample respectively.

### 2.2. Measures

#### *2.2.1. The 42-item Chronic Pain Coping Inventory (CPCI-42)*

The CPCI-42 consists of 42 items assessing coping strategies patients might use to cope with chronic pain [1; 6]. The coping strategies are grouped into eight subscales: Guarding, Resting, Asking for Assistance, Relaxation, Task Persistence, Exercise/Stretch, Seeking Social Support, and Coping Self-Statements. Patients were asked to rate the number of days (0-7 days) over the past week when they used each of the strategies at least once.

The Chinese version of CPCI (ChCPCI) was translated by the first author. Comprehensibility and appropriateness of the language in the Chinese cultural context were emphasized for the translation and cross-cultural adaptation procedure. The initial Chinese version was back-translated into English by a bilingual psycholinguist. The back-translation (in

[*] $1 U.S. = $7.8 HK.

English) was then reviewed by the authors of the original English version of CPCI for the content equivalence between the back-translation and the original versions of the CPCI. Discrepancies were discussed and resolved by joint agreement between the first author of this report and the original authors of the instrument. Modifications were made to individual items with reference to the original authors' opinions to compose the penultimate ChCPCI-42. The penultimate ChCPCI-42 was subsequently evaluated by a panel consisting of 11 bilingual postgraduate students. Each panel member was asked to rate on a 5-point Likert scale (5=excellent, 4=very good, 3=good, 2=fair, 1=poor) on the fluency and semantic equivalence of the Chinese translation against the original English version of CPCI-42 items. The results of the panel evaluation showed that of the 42 items, 23 obtained a mode rating of 5, suggesting an excellent equivalence of the item translation. The remaining items had a mode rating of 4, indicating good equivalence of the English-Chinese translation. The penultimate ChCPCI-42 was subsequently piloted in 10 local Chinese patients attending a public hospital orthopaedics specialist out-patient clinic in Hong Kong. The patients indicated that the instructions and the items were easy to understand. The finalized Chinese translation of the ChCPCI-42 was prepared based on the results the above translation and evaluation processes.

### *2.2.2. Chronic Pain Grade (CPG)*

The presence of chronic pain was first identified by affirmative answers to two questions: (i) "Are you currently troubled by physical pain or discomfort, either all the time, or on and off?", (ii) Have you had this pain or discomfort for more than 3 months?" [9]. Subjects answering yes to both questions were then asked about site and duration of their pain. Chronic pain severity was assessed using the Chronic Pain Grade (CPG) questionnaire [10], a seven-item instrument that measures severity in three dimensions: persistence, intensity and disability. Rating on an 11-point scale (0 = no pain at all; 10 = pain as bad as could be), three pain intensity items assess the present, average, and worst pain of the respondents. The "Pain Intensity Score" (score range: 0-100) is derived by the mean of the sum of the three pain intensity items and multiplied by 10. Three items measured pain interference with daily activities, social activities, and working ability on an 11-point rating scale (0 = no interference/change, 10 = unable to carry on activities/extreme change). The "Disability Score" (score range: 0-100) is derived by the mean of the sum of the three interference items and multiplied by 10. The Disability Score and the

disability days are recoded and summed, yielding ~~ the~~ "Disability Points". Based on the Pain Intensity Score and Disability Points, CPG classifies chronic pain into five hierarchical grades: Grade Zero (pain free), Grade I (low disability-low intensity), Grade II (low disability-high intensity), Grade III (high disability-moderately limiting) and Grade IV (high disability-severely limiting). ~~Considering t~~The IASP definition of chronic pain ~~by IASP~~ [9] ~~as~~ is pain which has persisted for at least 3 months. To accommodate this~~,~~ we changed the time frame ~~of~~ for CPG items from 6 months to 3 months. The English version of the CPG possesses good psychometric properties [11] and is responsive to change over time [12]. The underlying structure of the CPG (excluding the screening question) among Chinese was assessed using Exploratory Factor Analyses (EFA) [13]. EFA with promax rotation showed that the six items were grouped into 3 main dimensions: Disability (which explained 43.33% of total variance with eigenvalues = 3.47), Intensity (which explained 15.25% of total variance with eigenvalues = 1.22) and Persistence (which explained 12.94% of total variance with eigenvalues = 1.04). All items loaded to the corresponding factors with moderate to high factor loadings (ranging from 0.67 to 0.91). Cronbach $\alpha$'s for the Disability and Intensity dimensions were 0.87 and 0.68 respectively.

### *2.2.3. Pain Catastrophizing Scale (PCS)*

Rat~~ied~~ng on a 5-point scale (0=not at all, 4=all the time), the 13-item Pain Catastrophizing Scale (PCS) was designed to assess thoughts and feelings that individuals may experience when they are in pain. Respondents are asked to reflect on past painful experiences and to indicate to extent to which they experienced each of 13 thoughts or feelings when experiencing pain. The PCS is composed of three subscales (~~including~~ Rumination, Magnification, and Helplessness) and ~~the~~ generates a total score ~~is~~ rang~~inged~~ from 0 to 52. The PSC has demonstrated good internal consistency (Cronbach's $\alpha$ = 0.87), test-retest reliability at 6 weeks ($r$ = 0.75), and construct validity [14]. The Chinese ~~version of~~ PCS also ~~possessed~~ showed good psychometric properties (Cronbach's $\alpha$ = 0.93, item-total correlation coefficients ranged from 0.58 to 0.78) [15].

### *2.2.4. Centre for Epidemiological Studies --- Depression Scale (CES-D)*

Respondents' mental health was evaluated with the Centre for Epidemiological Studies --- Depression scale (CES-D) [16], ~~which is~~ a 20-item measure designed for assessing frequency

of depressive symptoms in non-psychiatric populations during the past week on a 4-point Likert scale (0=less than one day; 3=5-7 days). The scale is composed of four subscales: ~~including~~ Depressed Affect, Reduced Activities, Positive Affect (reversed scored), and Interpersonal Problems, and the total score is obtained by summing the responses of all items, with higher scores indicating greater depressive symptoms (score range: 0-60). The CES-D demonstrated good concurrent validity with clinical diagnoses of depression in chronic pain populations [17; 18]. The Chinese version has been validated, yielding good internal consistency (Cronbach's $\alpha$ = 0.77) and reliability ($r$ = 0.77) [19].

**3. Statistical Analysis**

Using SPSS (Statistical Package for the Social Sciences) version 15.0 [20], descriptive statistics summarized the characteristics of the sample. To determine internal consistency, Cronbach's $\alpha$ were computed for each of the ChCPCI-42 subscales. The construct validity of the ChCPCI-42 factors was assessed against the CPG pain intensity and disability scores, CES-D, and PCS scores.

Confirmatory factor analyses (CFA) using EQS for Windows 6.1 structural equation modeling program [21] was used to examine the factor structure of the ChCPCI-42. Prior to CFAs, univariate skew and kurtosis as well as Mardia's coefficient for skewness and kurtosis were computed to examine univariate and multivariate normality assumptions in the present Chinese sample data [22]. Each of the 42 items was specified to load on its respective factor based on the eight hypothesized pain coping strategies of CPCI-42 as reported in Romano et al. [6]. Specifically, 7 items (item 7, 20, 22, 25, 30, 32, and 26)[†] were specified to load on a single latent factor "Guarding" (Model 1). While 5 items (item 3, 12, 31, 37, and 42) were loaded on the factor "Resting" (Model 2), 4 items (item 5, 16, 26, and 40) were loaded on the factor "Asking for Assistance" (Model 3). Five 5 items were constrained to load on "Relaxation" (item 1, 8, 23, 33, and 38) (Model 4) and "Task Persistence" (item 2, 18, 21, 34, and 41) (Model 5) respectively. The factor of "Exercise/Stretch" were hypothesized to be explained by 6 items (item 9, 19, 27, 35, and 39) (Model 6) and "Seeking Social Support" by 5 items (item 4, 11, 13, 14, and 28) (Model 7). Five items (item 6, 10, 15, 17, and 29) were specified to load on "Coping

[†] Item numbers refer to items as reported by Romano et al. [6]Romano JM, Jensen MP, Turner JA. The Chronic Pain Coping Inventory-42: reliability and validity. Pain 2003;104(1-2):65-73.

Self-Statements" (Model 8). The CPCI was designed to assess eight theoretically-derived pain coping strategies and the eight factors were not necessarily correlated to each other. As such, the eight factors were tested individually and no second-order factor was hypothesized to cause each of the eight first-order factors. Model fit was assessed using $\chi^2$ statistics, comparative fit index (CFI) [23], non-normed-fit index (NNFI) [24], root mean square error of approximation (RMSEA) [25], and 90% confidence interval of RMSEA (CI). CFI and NNFI value of ≥ 0.90, and RMSEA value of ≤ 0.08 were indicative of good fit [25; 23].

Three hierarchical multiple regression models were fitted to evaluate the extent to which the ChCPCI-42 subscales associated with concurrent chronic pain adjustment outcomes including depression, pain intensity, and disability respectively. In all models, socio-demographic variables that were significant in univariate analyses ($p < 0.05$) were entered in the first block to control for potential confounding effects. Two pain variables, including pain duration and number of pain sites, were entered in the second block, followed by PCS. Finally, the eight ChCPCI-42 subscales were entered in the regression equations. The dependent variables of pain intensity and disability were indexed by the CPG Pain Intensity Score and Disability Score respectively.

## 4. Results

### *4.1. Pain Characteristics*

The present sample had an average of 1.89 (SD = 1.44) pain sites with 51.4 % reporting ~~having~~ a single pain site and 48.7% ~~having~~ multiple pain sites (Table 1). The most common pain site was leg (37%), followed by low back (28.8%) and hand (26.9%). Patients ~~participated in the present study had~~reportedly experienced an average of 4.15 years (SD = 5.8) of pain problems. While over half (54.3%) had had ~~chronic~~ pain for up to 2 year's duration, 22.6% had suffered from chronic pain for more than 5 years. The mean scores of present, average, and worst pain were 3.98 (SD = 2.70), 5.40 (SD = 2.16), and 7.54 (SD = 2.38) respectively. On pain interference measures, the present sample obtained a mean score of 5.82 (SD = 2.98), 5.00 (SD = 3.40), and 5.79 (SD = 3.36) on daily activities, social activities, and working ability respectively. The sample reported an average of 25.38 days (SD = 38.10) of pain associated disability. The CPG classification placed 52.5~~5~~% of the sample as Grade III or above (high disability and moderately

to severely limiting). The mean total scores of PCS ~~PCS~~ and CES-D ~~was~~ were 29.00 (SD = 14.30) and 17.99 (SD = 14.06) respectively.

### *4.2. Factorial validity of the ChCPCI-42*

The univariate skew estimates for the ChCPCI-42 items ranged from -2.18 to 1.90. The univariate kurtosis estimates ranged from -1.76 to 3.74. Mardia's normalized estimate of multivariate kurtosis was 147.91. These estimates indicated that the present data was not normally distributed, we therefore reported the Satorra-Bentler chi-square statistic~~s~~ as ~~it~~ this incorporates a scaling correction for non-normal sampling distributions [26].

Table 2 presents the results of CFAs applied on the present sample for the eight ChCPCI-42 subscales. Model 2 (CFI = 0.964, NFI = 0.942, RMSEA = 0.084, 90% CI: 0.022, 0.145), Model 3 (CFI = 0.993, NFI = 0.978, RMSEA = 0.048, 90% CI: 0.00, 0.154), Model 4 (CFI = 0.933, NFI = 0.909, RMSEA = 0.105, 90% CI: 0.051, 0.164), and Model 8 (CFI = 0.975, NFI = 0.951, RMSEA = 0.066, 90% CI: 0.000, 0.129) fitted the data well with CFI and NFI meeting the minimum acceptable fit criterion ($\geq 0.90$). Acceptable data-model fit was observed for Model 6 with CFI (= 0.921) meeting the minimum acceptable criterion but the NFI was <0.90. Model 1 (CFI = 0.890, NFI = 0.849), Model 5 (CFI = 0.895, NFI = 0.876), and Model 7 (CFI = 0.848, NFI = 0.832) demonstrated medium fit. The standardized factor loadings of all items on their respective factors were statistically significant ($p < 0.05$).

### *4.3. Reliability and validity the ChCPCI-42*

Table 3 presents the internal consistency (Cronbach's α~~s~~) and descriptive statistics of the ChCPCI-42. The eight ChCPCI-42 scales demonstrated good internal consistency with Cronbach's α~~s~~ ranging from 0.686 to 0.789. Task Persistence obtained the highest mean of 4.32 (SD =1.75), suggesting that it was the most frequently used pain coping strategy in the present sample. In particular, among the 5 Task Persistence items, item 34 "I just kept going" was the most commonly used task persistence strategy to cope with pain (mean = 6.16, SD = 1.78). Seeking Social Support was amongst the eight subscales the least frequently used pain coping method (mean = 1.54, SD = 1.64).

Except Task Persistence and Exercise/Stretch, the remaining six ChCPCI-42 scales were ~~significantly~~ positively correlated with the CES-D, PCS, pain intensity, and disability ~~in a~~

~~positive direction~~ (all $p < 0.05$) (Table 3). Task Persistence consistently demonstrated an inverse relationship with CES-D ($r$ = -0.25, $p < 0.01$), PCS ($r$ = -0.04, ns), pain intensity ($r$ = -0.01, ns), and disability ($r$ = -0.16, $p < 0.05$). Significant relationships were found ~~on~~ between Exercise/Stretching ~~with~~ and PCS ($r$ = 0.18), pain intensity ($r$ = 0.21), and disability ($r$ = 0.27) (all $p < 0.01$), but not with CES-D ($r$ = 0.11, ns).

### *4.4. Predicting concurrent chronic pain adjustment outcomes with ChCPCI-42 scales*

Table 4 reports the results of hierarchical multiple regression analyses. After controlling for socio-demographic and pain variables, both PCS ($F(1, 185) = 66.05$, $p < 0.001$) and ChCPCI-42 scales ($F(8,177) = 3.07$, $p < 0.01$) contributed significantly to the prediction of concurrent depression. While ChCPCI-42 accounted for 8% of the total variance in depression scores, only Task Persistence emerged as significant ~~predictor of~~correlate of concurrent depression ($\beta$ = -1.87, 95% CI: -2.87, -0.88, $p < 0.001$).

After adjusting for socio-demographic and pain variables, only PCS ($F(1, 183) = 29.81$, $p < 0.001$) contributed significantly to the prediction of concurrent pain intensity, explaining 11% of the total variance. ChCPCI-42 scales, however, did not significantly predict concurrent pain intensity (all $p > 0.05$).

When socio-demographic and pain variables were controlled, both PCS ($F(1, 187) = 38.03$, $p < 0.001$) and ChCPCI-42 scales ($F(1, 179) = 4.35$, $p < 0.001$) contributed significantly to the prediction of concurrent disability. The amount of unique variance explained by PCS and ChCPCI-42 scales were 15% and 12% respectively. Of the eight ChCPCI-42 scales, Task Persistence ($\beta$ = -2.86, 95% CI: -4.96, -0.75, $p < 0.01$) and Exercise/Stretch ($\beta$ = 2.16, 95% CI: 0.07, 4.26, $p < 0.05$) significantly predicted concurrent disability.

## 5. Discussion

The aim of the present paper was to examine the factor structure, reliability, and construct validity of the Chinese version of CPCI-42 (ChCPCI-42) in a sample of Chinese chronic pain patients. Our results indicated that the ChCPCI-42 is a valid and reliable Chinese translation of the CPCI-42 based on its satisfactory internal consistency, replication of the 8-factor structure by CFA, correlations with depression, pain intensity, and disability measures in the expected direction, and associations with chronic pain adjustment outcomes.

Our results of CFAs reaffirmed the existing model that the 42 pain coping strategies as assessed by CPCI-42 were most adequately represented by the eight hypothesized factors as reported by Romano et al. [6] in the present Chinese sample. Of the eight subscales, five (including Resting, Asking for Assistance, Relaxation, Exercise/Stretch, and Coping Self-Statements) possessed acceptable to good data-model fit, whereas three (including Guarding, Task Persistence, and Seeking Social Support) demonstrated medium fit. These findings offer tentative evidence for the cross-cultural validity of the CPCI-42 in that the underlying latent constructs of the CPCI-42 are similar for both the present Chinese and the American chronic pain sample ~~as reported by~~of Romano et al. [6]. Although we cannot directly evaluate cross-cultural factorial invariance, from a cross-cultural perspective, these findings tentatively suggest that there would be no differences between Chinese and American chronic pain patients in terms of the underlying structure of pain coping strategies as assessed by CPCI-42. Differences in CPCI-42 mean scores would therefore indicate true group differences or effects of an intervention on the underlying construct, rather than a change in the factor structure of the scale. The replication of the CPCI-42 in the present Chinese sample might be partly explained by the similarities of patients characteristics between the present sample and the sample employed in Roman et al. [6]. Yet, we encourage future investigations to directly examine cross-cultural factorial invariance of CPCI-42 in future.

The internal consistency of the ChCPCI-42 was supported with Cronbach $\alpha$~~s~~ ranging from 0.686 to 0.789 for the eight subscales. Correlations of ChCPCI-42 subscales with depression, catastrophizing~~ thinking~~, pain intensity, and disability were all in the expected direction, and the strength of the correlations was generally comparable with other studies [2; 7; 6; 8]. Of the eight ChCPCI-42 subscales, the strength of correlation for Guarding with the other criterion measures was the strongest, suggesting that more frequent use of guarding coping method was related to higher level of depressive symptoms, more catastrophizing thinking, higher pain intensity and disability. In contrast, more frequent use of task persistence as pain coping strategy was related to lower level of depressive symptoms, fewer catastrophizing thinking, lower pain intensity and disability.

It is noteworthy that the mean scores of the ChCPCI-42 subscales in the present Chinese sample were low. To verify this, we conducted t-tests to compared the mean scores of the eight CPCI-42 subscales between the present Chinese sample and those reported in Romano et al. [6]

based on an American sample. The results of post-hoc analyses showed that, except Relaxation ($t$ = 1.76, ns) and Task Persistence ($t$ = 1.65, ns), the present Chinese sample scored significant lower on the other six subscales (Guarding: $t$ = 8.09, $p < 0.001$; Resting: $t$ = 3.72, $p < 0.01$; Asking for Assistance: $t$ = 5.00, $p < 0.001$; Exercise/Stretch: $t$ = 2.28, $p < 0.05$; Seeking Social Support: $t$ = 10.02, $p < 0.001$; Coping Self-Statements: $t$ = 7.21, $p < 0.001$). These findings tentatively indicated these six types of pain coping strategies were less commonly used by Chinese chronic pain patients as compared to American chronic pain patients, whereas Relaxation and Task Persistence were common coping strategies employed by chronic pain patients in the two countries to deal with pain. Previous studies evidenced cognitive behavioural therapy (CBT) was effective in altering patients' maladaptive cognitive and behavioural responses to pain [27; 28]. However, since only 3.4% of the present sample self-reported having received psychotherapy or counselling for their pain problems, it is unlikely that our findings regarding the less frequent use of pain coping strategies were confounded by possible effects of psychotherapy. Yet, the less frequently used of the six pain coping strategies might be partly related to the shorter pain duration of the present sample as compared to the American sample (mean = 5.86 years, SD = 7.30; $t$ = 2.48, $p < 0.05$). An alternative explanation is that these coping strategies contain a culture-bound element. Cross-cultural studies to directly assess pain coping strategies ~~and their associated factor in future~~ are ~~encouraged~~required to clarify these differences.

The predictive validity of the ChCPCI-42 was also evidenced. While ChCPCI-42 subscales did not predict concurrent pain intensity, they significantly contributed to explaining 8% and 12% of the variance in concurrent depression and pain disability respectively. Our results showed that Task Persistence was the strongest predictor of concurrent depression and pain disability amongst the eight CPCI subscales, whilst Guarding did not significantly predict any pain adjustment outcomes assessed. These findings were in line with Tan et al.'s [5] report that CPCI appeared to be more strongly associated with disability, but departed from Truchon et al.'s [8] report in which Guarding was found to be the best CPCI subscale in predicting concurrent disability ($\beta$ = 2.93, $p < 0.05$) and depressive mood ($\beta$ = 1.68, $p < 0.05$). While Truchon et al. [8] reported a negative association between the Exercise/Stretch subscale and pain intensity, our data demonstrated the opposite relationship, that more frequent use of exercise or stretch was predictive of concurrent pain disability. One may argued that these inconsistent

findings pointed to the problem of the simplistic classification system of pain coping strategies into the active-passive or adaptive-maladaptive dimensions. We however considered these classification systems provide a parsimonious framework to understand the relationship between coping strategies and adjustment outcomes; yet, the categories characterized under these systems are not static. A wide range of factors such as disease stage, type of pain problem, and individual differences (~~e.g., ~~personality, mood, pain beliefs, etc) may interact to influence adjustment outcome over time, thereby the meaning of the coping strategy categories. As such, active participation in physical activity might seem to be an adaptive, wellness-focused coping strategy to relieve pain and/or improve physical and social functioning; however, it may also put the patients at risk of injury thereby hampering physical functioning if the patients engaged in exercise while the disease is still active or without proper guidance from doctors and/or physiotherapists. Future studies to explore how different clinical and psychological variables influence the differential effects of pain coping strategies on adjustment outcomes are therefore warranted.

The present study replicated previous findings based on Western samples regarding the role of cognitive appraisals and responses in pain adjustment [2; 8]. Specifically, pain catastrophizing thinking was consistently shown to be the most important factor predicting chronic pain adjustment, accounting for the biggest amount of variances in all three models tested (11% - 22%). Patients with exaggerated negative orientation toward pain also ~~had~~ reported higher levels of concurrent depressive symptoms, pain intensity and disability. These findings offered further evidence for the role of cognitive appraisals and responses in pain adjustment.

Caution~~s should be exercised~~is warranted ~~when~~ in interpreting and generalizing the findings of this study. The construct validity and psychometric properties reported for the ChCPCI-42 in the present study should be considered as tentative since this ChCPCI-42 translation was within a Cantonese-speaking context and the scale was validated on Cantonese speaking Hong Kong-Chinese. The extent to which the ChCPCI-42 can be generalized to Chinese populations speaking other Chinese dialects remains unknown. Examination of the ChCPCI-42 in other Chinese populations is therefore desirable. Since the predictive validity of the ChCPCI-42 in the present study was determined based on cross-sectional analyses, future studies that employ longitudinal prospective designs could help delineate the causality between coping strategies and adjustment outcomes of chronic pain. In particular, analytic approaches

such as ~~structure equation~~Latent Growth Curve modelling [29] could be used to disentangle the potential nonlinear relationship amongst ChCPCI-42 subscales, catastrophizing thinking, pain variables, and adjustment outcomes.

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**Table 1: Pain characteristics of the sample**

| Pain Characteristics | % |
|---|---|
| **Number of pain sites; M (SD)** | 1.89 (1.44) |
| 1 | 51.4 |
| 2 | 26.9 |
| 3-5 | 19.3 |
| ≥6 | 2.5 |
| **Pain site** | |
| Head | 2.9 |
| Neck | 13.0 |
| Shoulder | 20.7 |
| Hand | 26.9 |
| Chest | 1.9 |
| Upper back | 9.1 |
| Low back | 28.8 |
| Pelvis | 13.5 |
| Knee | 14.9 |
| Leg | 37.0 |
| Joint | 13.9 |
| Muscle | 2.4 |
| Nerve | 1.9 |
| Others | 1.4 |
| **Pain duration (years); M (SD)** | 4.15 (5.83) |
| ≥ 3 months - 2 years | 54.3 |
| > 2 years - 5 years | 23.1 |
| > 5 years - 10 years | 14.4 |
| > 10 years | 8.2 |
| **Pain intensity[a]; M (SD)** | |
| Present pain | 3.98 (2.70) |
| Average pain | 5.40 (2.16) |
| Worst pain | 7.54 (2.38) |
| **Pain interference[b]; M (SD)** | |
| Daily activities | 5.82 (2.98) |
| Social activities | 5.00 (3.40) |
| Working ability | 5.79 (3.36) |
| **Pain associated disability (days); M (SD)** | 25.38 (38.10) |
| **Chronic Pain Grade classification[c]** | |
| Grade Zero | 0.5 |
| Grade I | 24.0 |
| Grade II | 23.0 |
| Grade III | 26.5 |
| Grade IV | 26.0 |
| **PCS; M (SD)** | 29.00 (14.30) |

| | |
|---|---|
| **CES-D; M (SD)** | 17.99 (14.06) |

Note: Figures are percentages unless otherwise stated; The pain intensity and pain interference scores were drawn from individual items of the Chronic Pain Grade questionnaire. PCS: Pain Catastrophizing Scale; CES-D: Center for Epidemiological Studies – Depression Scale.

[a] Scores range from 0-10; higher scores indicate higher intensity of pain.

[b] Scores range from 0-10; higher scores indicate higher level of interference.

[c] Grade Zero: Pain free; Grade I: low disability-low intensity; Grade II: low disability-high intensity; Grade III: high disability-moderately limiting; Grade IV: high disability-severely limiting.

**Table 2: Results of CFAs testing factorial validity of 8 subscales of the ChCPCI-42**

| Model | S-B$\chi^2$ | *df* | *P* value | CFI | NFI | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|
| 1. Guarding | 42.740 | 14 | <0.001 | 0.890 | 0.849 | 0.100 | 0.066, 0.134 |
| 2. Resting | 12.085 | 5 | 0.034 | 0.964 | 0.942 | 0.084 | 0.022, 0.145 |
| 3. Asking for Assistance | 2.936 | 2 | 0.230 | 0.993 | 0.978 | 0.048 | 0.000, 0.154 |
| 4. Relaxation | 16.445 | 5 | 0.006 | 0.933 | 0.909 | 0.105 | 0.051, 0.164 |
| 5. Task Persistence | 26.513 | 5 | <0.001 | 0.895 | 0.876 | 0.200 | 0.093, 0.200 |
| 6. Exercise/Stretch | 33.404 | 9 | <0.001 | 0.921 | 0.897 | 0.115 | 0.075, 0.157 |
| 7. Seeking Social Support | 35.948 | 5 | <0.001 | 0.848 | 0.832 | 0.174 | 0.123, 0.229 |
| 8. Coping Self-Statement | 9.511 | 5 | 0.090 | 0.975 | 0.951 | 0.066 | 0.000, 0.129 |

Note: ChCPCI: The Chinese version of the 42-item Chronic Pain Coping Inventory; S-B$\chi^2$: Satorra and Bentler scaled chi-square statistics; *df*: Degree of freedom; CFI: Comparative fit index; NIF: Normed fit index; RMSEA: Root mean square error of approximation; CI: Confidence interval.

**Table 3: Internal consistency, means (standard deviations), and correlations of the ChCPCI-42 scales with measures of depression, catastrophizing thinking, pain intensity, and disability**

| | | | | Pearson's Correlation | | | |
|---|---|---|---|---|---|---|---|
| | Number of item | Mean (SD) | Cronbach α | Depression[a] | Catastrophizing Thinking[b] | Pain Intensity[c] | Disability[d] |
| **Guarding** | 7 | 3.06 (1.84) | 0.710 | 0.40** | 0.41** | 0.37** | 0.43** |
| **Resting** | 5 | 3.64 (1.93) | 0.724 | 0.23** | 0.32** | 0.32** | 0.37** |
| **Asking for Assistance** | 4 | 2.08 (2.08) | 0.749 | 0.14* | 0.16* | 0.17* | 0.27** |
| **Relaxation** | 5 | 1.94 (1.70) | 0.723 | 0.17* | 0.23** | 0.21** | 0.22** |
| **Task Persistence** | 5 | 4.32 (1.75) | 0.692 | -0.25** | -0.04 | -0.01 | -0.16* |
| **Exercise/Stretch** | 6 | 2.52 (1.89) | 0.789 | 0.11 | 0.18** | 0.21** | 0.27** |
| **Seeking Social Support** | 5 | 1.54 (1.64) | 0.774 | 0.15* | 0.27** | 0.21** | 0.28** |
| **Coping Self-Statement** | 5 | 2.69 (1.83) | 0.686 | 0.17* | 0.30** | 0.15* | 0.27** |

Note: ChCPCI-42: The Chinese version of the 42-item Chronic Pain Coping Inventory; SD: Standard deviation.
[a] Indexed by the CES-D total score; scores range from 0-60 with higher scores indicating higher level of depressive symptoms.
[b] Indexed by the PCS; scores range from 0-52 with higher scores indicating more frequent pain catastrophizing thinking.
[c] Indexed by the CPG Pain Intensity Score; scores range from 0-100 with higher scores indicating higher pain intensity.
[d] Indexed by the CPG Disability Score; scores range from 0-100 with higher scores indicating greater level of disability.
* $p < 0.05$; ** $p < 0.01$.

**Table 4: Hierarchical multiple regression analyses predicting concurrent depression, pain intensity, and pain disability with the ChCPCI-42 scales**

| | Depression | | | Pain Intensity | | | Pain Disability | | |
|---|---|---|---|---|---|---|---|---|---|
| | $\beta$ | SE | 95% CI | $\beta$ | SE | 95% CI | $\beta$ | SE | 95% CI |
| **1. Socio-demographic variables** | | | | | | | | | |
| Gender | --- | --- | --- | 5.75* | 2.67 | 0.48, 11.02 | --- | --- | --- |
| Age | --- | --- | --- | 0.05 | 0.13 | -0.20, 0.29 | --- | --- | --- |
| Marital status | --- | --- | --- | --- | --- | --- | 1.70 | 1.92 | -2.08, 5.48 |
| Household income | -0.48 | 0.42 | -1.31, 0.36 | --- | --- | --- | --- | --- | --- |
| Education level | -1.57* | 0.68 | -2.90, -0.23 | -2.99** | 1.08 | -5.12, -0.86 | -2.70 | 1.47 | -5.59, 0.19 |
| Employment status | 1.01* | 0.46 | 0.10, 1.92 | 0.84 | 0.75 | -0.63, 2.32 | --- | --- | --- |
| $R^2$ | 0.08 | | | 0.12 | | | 0.03 | | |
| $\Delta R^2$ | 0.08 | | | 0.12 | | | 0.03 | | |
| $\Delta F$ | 5.65** | | | 6.22*** | | | 3.23* | | |
| **2. Pain variables** | | | | | | | | | |
| Pain duration | -0.99 | 0.89 | -2.71, 0.72 | -1.81 | 1.34 | -4.46, 0.84 | -4.64* | 1.82 | -8.23, -1.04 |
| Number of pain sites | 1.43* | 0.64 | 0.18, 2.69 | 2.87** | 1.00 | 0.90, 4.85 | 1.39 | 1.36 | -1.29, 4.08 |
| $R^2$ | 0.16 | | | 0.22 | | | 0.13 | | |
| $\Delta R^2$ | 0.07 | | | 0.10 | | | 0.09 | | |
| $\Delta F$ | 7.92** | | | 11.96*** | | | 10.10*** | | |
| **3. PCS Catastrophizing** | 0.42*** | 0.67 | 0.29, 0.55 | 0.40*** | 0.10 | 0.20, 0.60 | 0.51*** | 0.14 | 0.23, 0.78 |
| $R^2$ | 0.38 | | | 0.33 | | | 0.27 | | |
| $\Delta R^2$ | 0.22 | | | 0.11 | | | 0.15 | | |
| $\Delta F$ | 66.05*** | | | 29.81*** | | | 38.03*** | | |
| **4. ChCPCI-42 scales** | | | | | | | | | |
| Guarding | 1.03 | 0.58 | -0.12, 2.18 | 1.44 | 0.91 | -0.362, 3.24 | 2.39 | 1.23 | -0.05, 4.82 |
| Resting | -0.10 | 0.54 | -1.16, 0.97 | 0.73 | 0.83 | -0.91, 2.37 | 1.33 | 1.15 | -0.93, 3.60 |
| Asking for assistance | 0.08 | 0.51 | -0.93, 1.09 | 0.62 | 0.79 | -0.94, 2.18 | 0.98 | 1.10 | -1.18, 3.15 |
| Relaxation | 0.78 | 0.62 | -0.44, 2.00 | 0.75 | 0.95 | -1.13, 2.62 | -1.32 | 1.32 | -3.93, 1.30 |
| Task persistence | -1.87*** | 0.51 | -2.87, -0.88 | -0.26 | 0.79 | -1.81, 1.29 | -2.86** | 1.07 | -4.96, -0.75 |
| Exercise/Stretch | -0.51 | 0.51 | -1.51, 0.50 | 0.36 | 0.79 | -1.21, 1.93 | 2.16* | 1.06 | 0.07, 4.26 |
| Seeking social support | -0.45 | 0.62 | -1.67, 0.77 | -1.33 | 0.98 | -2.07, 1.80 | 0.60 | 1.32 | -2.01, 3.20 |
| Coping self-statements | 0.21 | 0.58 | -0.93, 1.35 | -1.19 | 0.89 | -2.94, 0.55 | 1.57 | 1.21 | -0.83, 3.97 |
| $R^2$ | 0.45 | | | 0.37 | | | 0.39 | | |
| $\Delta R^2$ | 0.08 | | | 0.04 | | | 0.12 | | |
| $\Delta F$ | 3.07** | | | 1.37 | | | 4.35*** | | |

Note: Depression was indexed by the Center for Epidemiological Studies – Depression Scale; Pain intensity was indexed by the CPG Pain Intensity Score, with scores ranging from 0-100 and higher scores indicating higher pain intensity; Pain disability was indexed by the CPG Disability Score with scores ranging from 0-100 and higher scores indicating greater level of disability; ChCPCI-42: The Chinese version of the 42-item Chronic Pain Coping Inventory; PCS: Pain Catastrophizing Scale; $\beta$: Beta coefficient; *SE*: Standard error; CI: Confidence interval; Δ: Change.
* $p < 0.05$; ** $p < 0.01$.