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Validation of a Chinese version of the Chronic Pain Acceptance Questionnaire (CAPQ) and CPAQ-8 in chronic pain patients

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Abstract

Acceptance of chronic pain has increasingly become a significant issue in the field of pain management. Many researchers have suggested that patients with better acceptance of pain are more likely to have better functioning both in physical and psychological status. In many countries, the Chronic Pain Acceptance Questionnaire (CPAQ) and CPAQ-8 have been validated and utilized frequently to measure the pain acceptance of patients with chronic pain. However, the CPAQ and CPAQ-8 yet have not been introduced and validated in Mainland China.

In this study, we aimed to translate the English version of the CPAQ into simplified Chinese, make proper cross-cultural adaptations, and validate the psychometric properties of the Chinese version of the CPAQ and the CPAQ-8.

The English version of the CPAQ was first linguistically translated and cross-culturally adapted to formulate a Chinese version. Then, we recruited 224 patients from a pain clinic and every participant was asked to finish a series of questionnaires. Finally, statistical analysis was performed to test the psychometric properties of the CPAQ and the CPAQ-8.

Both confirmatory factor analysis (CFA) and principal component analysis (PCA) confirmed a 2-factor structure for the CPAQ and the CPAQ-8. Nine out of 10 of the hypotheses were validated for construct validity. The overall intraclass correlation coefficient (ICC) value for the CPAQ and CPAQ-8 were 0.92 and 0.89, respectively. In addition, the Cronbach α values for both the CPAQ and the CPAQ-8 showed excellent test–retest reliability.

In conclusion, the original CPAQ was successfully developed into the Chinese version of the CPAQ and CPAQ-8 with excellent validity and reliability. The scores of the CPAQ or CPAQ-8 might be a strong predictor for the physical and psychological function of chronic pain patients. In addition, to improve the satisfaction of surgery patients, we recommend measuring patients' pain acceptance using the CPAQ or CPAQ-8 before and after the surgery. For patients with lower acceptance, psychological interventions may be more effective than treatment that simply reduces symptoms. Finally, we suggest that the Chinese version of the CPAQ and CPAQ-8 are appropriate for use in clinical settings or fundamental research in Mainland China.

Abbreviation: ACT = Acceptance and Commitment Therapy, AE = activity engagement, BPI = Brief Pain Inventory, CFA = confirmatory factor analysis, CPAQ = Chronic Pain Acceptance Questionnaire, EFA = exploratory factor analysis, HADS = Hospital Anxiety and Depression Score, ICC = intraclass correlation coefficient, LBP = low back pain, PCA = principal component analysis, PW = pain willingness, TSK = Tampa Scale for Kinesiophobia.

Keywords: acceptance of chronic pain, CPAQ, CPAQ-8, depression, HADS, reliability, validity

1. Introduction

Chronic pain has increasingly attracted worldwide attention as a result of its high morbidity rate and poor prognosis. Studies have revealed that more than 10% of people in the world have experienced chronic pain,[1–4] and nearly 20% of the Chinese population has suffered from chronic pain.[5,6] The consequences of chronic pain include depression, anxiety, decreased physical

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activity, or even disability leading to immeasurable economic losses.[7] In recent years, a majority of studies have illustrated the significant role of psychological factors in the development of chronic pain,[7–9] and a different psychological intervention aimed at improving patients' acceptance of chronic pain has proven to be effective.[10]

The concept of "acceptance" was introduced by McCracken[11] in 1998, and it emphasized patients' reaction and adaption to chronic pain. The concept potentially encouraged patients to focus their attention on participating in meaningful activities, living a normal life and pursuing their own goals despite the presence of chronic pain. McCracken[12] suggested that patients with higher acceptance of chronic pain were more likely to live with less depression, less anxiety, and less physical and psychological disability. Since then, more and more studies have shown that accepting chronic pain positively was a distinctive and effective pain management strategy compared with conventional coping strategies.[13,14] Some studies noted that acceptance of chronic pain might be a strong predictor of the physical and psychological function of patients, which would be helpful for clinicians in identifying high-risk patients.[15,16]

To assess acceptance of chronic pain, Geisser [17] originally developed the Chronic Pain Acceptance Questionnaire (CPAQ) with 34 items included. Later, Vowles et al[18] revised the scale and proposed a 20-item CPAQ that involved 2 subscales (Activity Engagement and Pain Willingness). However, the 20-item CPAQ has been widely validated in many countries, including Germany,[19] Spain,[20] Australia,[8] Sweden,[21] Italy,[6] Finland,[22] Korea,[10] and Iran[23]. Researches in different cultures showed that the CPAQ had excellent reliability and validity. A 2-factor structure was also confirmed using confirmatory factor analysis (CFA) and principal component analysis (PCA).

Recently, Fish et al[8] developed an 8-item version of the CPAQ (CPAQ-8) from an Internet sample. In a further study, they confirmed that the CPAQ-8 was a reliable and valid scale in measuring pain acceptance.[24] Importantly, a 2-factor structure was also explored and verified for the CPAQ-8.[24] Due to its brevity, the CPAQ-8 might be more convenient to use in a clinical setting.

Unfortunately, a Chinese version of the CPAQ and CPAQ-8 is not available currently, and it is difficult for Chinese clinicians to measure the pain acceptance of patients. Therefore, in this study, we aimed to translate the English version of the CPAQ into simplified Chinese and validate the psychometric properties of the Chinese version of the CPAQ and CPAQ-8.

2. Methods

The English version of the CPAQ was first linguistically translated and cross-culturally adapted to formulate a Chinese version. Then, we recruited 224 patients from a pain clinic and every participant was asked to finish a series of questionnaires. Finally, statistical analysis was performed to test the psychometric properties of the CPAQ and the CPAQ-8.

2.1. Linguistic translation and cross-cultural adaptation

The English version of the CPAQ was linguistically translated into simplified Chinese and culturally adapted according to the established guidelines.[25] Two bilingual translators whose mother language was Chinese translated the English version into simplified Chinese independently. One translator, a researcher in this study, was aware of the objective of translation and the concepts of the CPAQ. The other translator, a professor majoring in English, was completely blinded to our study. The 2 translators integrated their results and arrived at 1 version. Back translation was then conducted independently by 2 English speakers who learned Chinese as their second language. An expert committee, including 4 translators, 2 clinicians who worked in a pain clinic, 1 statistician, and 1 physiotherapist, was established to compare all the translations with the original English version, and they developed a single Chinese version by consensus. Finally, the expert committee evaluated the semantic, conceptual, and idiomatic equivalences between the English version and the Chinese version.

A pretest of the Chinese version of the CPAQ was conducted in a cohort of 35 patients in a pain clinic. Each of the patients was asked to answer the questionnaires and to find out whether there was any difficulty or confusion in understanding every item. The expert committee recorded the answers and suggestions of all the patients. After proper modifications, the final Chinese version of the CPAQ was developed.

2.2. Participants

On the basis of the recommended 10:1 ratio of the number of participants to the number of items,[26] we recruited a cohort of 224 patients with chronic pain in the pain clinic of Changhai Hospital, a tertiary hospital in Shanghai, China. The inclusion criteria of our study were age over 18 years, nonmalignant chronic pain, without receiving interventions on chronic pain in the hospital, and ability to comprehend and answer the questionnaires. Patients with a psychiatric disorder were excluded, as they were not able to complete the questionnaires independently.

After consenting to the study, all the recruited patients were given a series of questionnaires for completion. These questionnaires involved a pain form for demographic and pain-related variables, the CPAQ, the Brief Pain Inventory (BPI), the Hospital Anxiety and Depression Score (HADS), and the Tampa Scale for Kinesiophobia (TSK). All the 224 participants completed the questionnaires independently and 75 participants among them were selected randomly to answer the CPAQ again 5 to 7 days later. Our study was approved by the Human Research Ethics Committee of Changhai Hospital, and a consent form was signed by every participant to ensure their willingness to engage in this study.

2.3. Instruments

2.3.1. CPAQ and CPAQ-8. The CPAQ is a 20-item inventory designed to measure the acceptance of chronic pain. It consists of 2 subscales: activity engagement (AE) and pain willingness (PW). The 11-item AE subscale measures the extent to which a patient engages in daily activities in spite of the presence of chronic pain sensations. The 9-item PW subscale measures the extent to which a patient believes that trying to avoid or to control pain feelings is a necessary strategy that works for them. Items that comprise the short form of the CPAQ, known as the CPAQ-8, come from the CPAQ. All the items are rated by participants on a scale from 0 (never true) to 6 (always true). By combining both subscales, we are able to obtain a total score. Higher scores indicate better acceptance. Previous studies in other cultures have confirmed the reasonable reliability and validity of the CPAQ, and a 2-factor structure was validated utilizing CFA and PCA.

2.3.2. The brief pain inventory (BPI). The BPI is designed to measure the pain severity and pain-related interference of patients. Participants rate their pain severity or interference on a scale from 0

(no pain or no interference) to 10 (worst pain or worst interference). Pain interference is measured in various aspects of life, including general activity, mood, walking ability, social relations, normal work, sleep, and life enlightenment. Higher scores indicate more severe pain and greater interference. The translated Chinese version of the BPI has been validated and widely used.[27]

2.3.3. Hospital anxiety and depression score (HADS). The HADS is a 14-item inventory that is widely used to measure anxiety and depression in outpatients. It has 2 subscales, and each item is scored from 0 to 3, with higher scores denoting more severe anxiety and depression. A Chinese version with sound reliability and validity has been successfully developed.[28]

2.3.4. TSK. The TSK is utilized to evaluate fear of movement. It consists of 17 items, and each item is scored from 1 (strongly disagree) to 4 (strongly agree). A total score is calculated, ranging from 17 to 68, with higher scores indicating greater fear of movement. The translated Chinese version has been widely used in Mainland China.[29]

2.4. Data analytic strategy

Descriptive statistics including mean values and standard deviations (SDs) were used to analyze all the items and demographic characteristics. Psychometric properties, including content validity, reliability, and construct validity, were analyzed using the Statistical Package for the Social Science (SPSS) version 18.0 (SPSS, Chicago, IL).[30,31] For all the analysis, a P value of < 0.05 was considered statistically significant.

Content validity is used to test whether the involved items measure the concept adequately and sufficiently. Each of the items was analyzed to verify whether it measured the same property after translation into simplified Chinese and cross-culturally adapted for Chinese patients. By utilizing response trend and Pearson correlation analysis, we were able to distinguish which items could not be scored in the normal range and which items had poor correlations with others. A Z-skewness value of >1.96 signified a response trend deviating from the normal distribution. An item-total correlation coefficient of <0.20 indicated that the item does not measure the same properties and should be eliminated.[32]

Construct validity refers to the extent to which a construct measures the intended concept. It is composed of 3 components as suggested in the COSMIN study: structural validity, cross-cultural validity, and hypothesis testing.[33] Structural validity is a property that examines the underlying structure of the items, whereas CFA is necessary for cross-cultural studies. Hypotheses are proposed according to the conceptual relevance between different scales.

To explore the underlying structure of the Chinese version of the CPAQ and CPAQ-8, an exploratory factor analysis (EFA) was conducted using PCA with varimax rotation. Subsequently, on the basis of the 2-factor structure explored above, CFA was performed to assess the goodness fit of the structure by fit indices, and the expected values of indices recommended by Marsh were as follows: Satorra–Bentler scaled chi-square (S-Bχ 2)/degrees of freedom ratio (CMIN/DF) <3.00; non-normed fit index (NNFI) >0.90; comparative fit index (CFI) >0.90; goodness-of-fit index (GFI) >0.90; root mean square error of approximation (RMSEA) <0.08.[34]

Acceptance of chronic pain indicates less focus on pain, and many factors might impact a patient's pain acceptance. It is understandable that patients with higher pain intensity are less likely to accept feelings of pain. Likewise, those who are frequently bothered by pain or pain-related sensations may not live a normal life. Thus, we proposed that the Chinese version of the CPAQ and CPAQ-8 should correlate moderately with pain intensity and pain interference measured by the BPI. The fear-avoidance model was introduced by Lethem in 1983, and it described how individuals develop chronic musculoskeletal pain due to avoidant behavior based on fear.[35] According to this model, patients who are afraid of feeling pain, which also indicates a low level of acceptance, may try to avoid pain, and alleviation of feelings of pain reinforces this behavior in turn. If the individual perceives the pain as nonthreatening or temporary, he or she feels less anxious or depressed.[35] On the basis of that, the Chinese version of the CPAQ and CPAQ-8 was hypothesized to correlate moderately with anxiety and depression. Compared with the PW subscale, lower scores on the AE subscale are thought to be more related to depression and anxiety as a result of worrying more about bad things or feelings. Fear of movement is considered an avoidant behavior.[36] Patients repeatedly try to avoid pain-inducing activity and are likely to overestimate pain from such activity in the future.[35,36] Therefore, the Chinese version of the CPAQ and CPAQ-8 should correlate moderately with TSK. Finally, we proposed the following hypotheses:

1. The Chinese version of the CPAQ and CPAQ-8 should correlate moderately with pain intensity from the BPI.
2. The Chinese version of CPAQ and CPAQ-8 should correlate moderately with pain interference from the BPI.
3. The Chinese version of CPAQ and CPAQ-8 should correlate moderately with anxiety from the HADS.
4. The Chinese version of CPAQ and CPAQ-8 should correlate moderately with depression from the HADS.
5. The AE and AE-4 should correlate moderately with anxiety from the HADS.
6. The AE and AE-4 should correlate moderately with depression from the HADS.
7. The PW and PW-4 should correlate moderately with anxiety from the HADS.
8. The PW and PW-4 should correlate moderately with depression from the HADS.
9. Compared with the PW subscale, the AE subscale should have a higher correlation with anxiety and depression.
10. The Chinese version of the CPAQ and CPAQ-8 should correlate moderately with the TSK.
11. The Pearson correlation analysis was performed to explore the correlations among CPAQ, CPAQ-8, and other related instruments. The values of Pearson correlation coefficients were classified as low correlation ($r=|0–0.30|$), moderate correlation ($r=|0.30–0.60|$), and high correlation ($r=|0.60–1.00|$).

2.5. Internal consistency and test–retest reliability

To test whether the items of the questionnaire measured the same property, internal consistency was assessed by calculating Cronbach α, with values from 0.80 to 0.95 denoting excellent consistency.[26] Meanwhile, the test–retest reliability, used to determine the consistency of a scale over a period of time, was performed by calculating the intraclass correlation coefficient (ICC) between the scores acquired at test and retest times. An ICC value of >0.70 indicated good reliability[26] and the 95% confidence interval (CI) of ICC value was presented.

Table 1

Demographic characteristics of patients from the pain clinic.

	Mean (SD) or N
Age, y	49.35 (16.60)
Male/Female	119/105
Occupation	
Labor	14
Peasant	56
White collar	14
Freelancer	14
Retired	70
Unemployed	42
Marital status	
Unmarried	17
Married	182
Divorced	18
Widowed	7
Education	
Primary school	35
Middle school	84
High school	28
College	77
Pain duration, mo	11.06 (12.55)
Income (RMB)	
Low <3000	84
Medium 3000–6000	63
High 6000–10000	42
Very high >10000	35
CPAQ-20	81.41 (21.41)
AE	41.96 (13.83)
PW	39.45 (10.65)
CPAQ-8	32.78 (9.36)
AE-4	14.99 (5.93)
PW-4	17.79 (5.28)
BPI	
Pain	17.04 (7.47)
Interference	564.45 (30.11)
HADS	
Anxiety	16.82 (6.05)
Depression	15.85 (7.14)
TSK	32.65 (110.69)

AE = Activity Engagement, BPI = Brief Pain Inventory, CPAQ = Chronic Pain Acceptance Questionnaire, HADS = Hospital Anxiety and Depression Scale, N = number, PW = Pain Willingness, SD = standard deviation, TSK = Tampa Scale for Kinesiophobia.

3. Results

3.1. Linguistic translation and cross-cultural adaption

After performing translation, adaption, and proper modifications, the expert committee finally developed the Chinese version of the CPAQ (see Supplemental Content 1, http://links.lww.com/MD/B209) and CPAQ-8 (see Supplemental Content 2, http://links.lww.com/MD/B209). Most patients had no difficulty or confusion while completing the questionnaires. However, several minor modifications were made. For example, item 3 "It is OK to experience pain" was translated as "我是可以忍受疼痛的" rather than "经历一点疼痛是可以的" based on the meaning the sentence, and item 20 "struggle to do things" was translated as "不得不付出更多" rather than "努力去做事" because the former translation is easier to understand.

3.2. Participant characteristics

The participants comprised 53.1% men and 46.9% women, aged 49.35 years on average (SD = 16.6 years). Most of the participants were married (81.3%), and the rest were unmarried (7.6%), divorced (8.0%), and widowed (3.1%) individuals. In addition, nearly one-third of the participants were retired (31.3%), whereas peasants and unemployed individuals constituted 25% and 18.9% of the whole sample, respectively. The mean duration of chronic pain was 11.06 months (SD = 12.55 months). Notably, only 34.3% of the participants had received a college education, and more than one-third of the participants were low-income. The mean total scores of the CPAQ, CPAQ-8, pain intensity, pain interference, anxiety, depression, and TSK were 81.41 (SD = 21.41), 32.78 (SD = 9.36), 17.04 (SD = 7.47), 564.45 (SD = 30.11), 16.82 (SD = 6.05), 15.85 (SD = 7.14), and 32.65 (SD = 110.69), respectively. As for the subscales, the AE subscale mean was 41.96 (SD = 13.83) and the PW subscale scored 39.45 (SD = 10.65). More details are presented in Table 1.

3.3. Content validity

The processes of translation and cross-cultural adaptation were reviewed by the expert committee, and the final Chinese version of the CPAQ and CPAQ-8 was successfully developed. As is summarized in Table 2, for all 20 items, the Z-skewedness values were <0.82, indicating that scores for each item followed a normal distribution. Moreover, the item-total correlation coefficients of all the items were >0.30. Therefore, no item was deleted from the Chinese version of the CPAQ and CPAQ-8.

3.4. Structure validity

On the basis of the scree plot (Figs. 1 and 2) and eigenvalues (Tables 3 and 4), a 2-factor structure was suggested. CFA was utilized to test the adequacy of the 2-factor structure. For the CPAQ, the results of the CFA (CMIN/DF = 3.415; NNFI = 0.757; CFI = 0.813; GFI = 0.796; RMSEA = 0.104) were acceptable. Surprisingly, data from the CPAQ-8 (CMIN/DF = 1.832; NNFI = 0.962; CFI = 0.982; GFI = 0.967; RMSEA = 0.061) had perfect goodness of fit, which strongly suggested that the 2-factor structure was the best fit for the CPAQ-8 (see Table 5). Standardized parameter estimates (Figs. 3 and 4) showed that there might be some correlations between different items. For example, in the CPAQ, item 8 was partly correlated with item 11. Likewise, a correlation between item 2 and item 3 in the CPAQ-8 was also found. Further research is needed to evaluate these correlations.

3.5. Hypothesis testing

Both the CPAQ and CPAQ-8 demonstrated a moderately negative correlation with pain interference and TSK score. However, only a weak correlation was found between pain intensity and the CPAQ ($r = -0.29$) and CPAQ-8 ($r = -0.27$), which was beyond our expectation. Moreover, anxiety was correlated moderately with the CPAQ, CPAQ-8, AE, AE-4, PW, and PW-4. Compared with anxiety, depression measured by the HADS had higher correlations with the CPAQ, AE, CPAQ-8, and AE-4 (r: −0.64 vs −0.60, −0.68 vs −0.57, −0.56 vs −0.54, −0.61 vs −0.50, respectively). Furthermore, the AE and AE-4 were more highly correlated with pain interference, anxiety, depression, and TSK scores than the PW and PW-4. Therefore, 9 of 10 of the hypotheses were confirmed (see Table 6).

3.6. Internal consistency and test–retest reliability

The Cronbach α for the CPAQ and CPAQ-8 were 0.90 and 0.84, respectively. The item-deleted Cronbach α of each item was no

Table 2

Corrected item-total correlation, response trend, and factor loading for each item in the Chinese version of the CPAQ (N = 224).

			Item-deleted		Factor loading	
	Z-skewedness	Corrected item-total correlation	Cronbach alpha	Missing values	AE	PW
Item 1	−0.35	0.63	0.9	0	0.8	0.15
Item 2	−0.42	0.58	0.9	0	0.62	0.27
Item 3	−0.39	0.6	0.9	6	0.61	0.3
Item 4	−0.59	0.47	0.9	4	0.14	0.64
Item 5	0.18	0.34	0.91	0	0.51	0.03
Item 6	−0.24	0.53	0.9	6	0.69	0.11
Item 7	−0.31	0.49	0.9	8	0.2	0.58
Item 8	−0.12	0.32	0.91	0	0.24	0.25
Item 9	−0.29	0.64	0.9	0	0.83	0.12
Item 10	0.06	0.47	0.9	0	0.57	0.15
Item 11	−1.02	0.56	0.9	4	0.31	0.61
Item 12	−0.81	0.6	0.9	6	0.68	0.26
Item 13	−0.72	0.62	0.9	0	0.22	0.76
Item 14	−0.61	0.6	0.9	0	0.18	0.78
Item 15	−0.46	0.65	0.9	0	0.72	0.27
Item 16	−0.51	0.61	0.9	0	0.23	0.73
Item 17	−0.2	0.64	0.9	0	0.26	0.72
Item 18	−0.3	0.45	0.9	0	0.06	0.65
Item 19	−0.3	0.61	0.9	6	0.66	0.25
Item 20	−0.42	0.48	0.9	8	0.08	0.73

AE = Activity Engagement, CPAQ = Chronic Pain Acceptance Questionnaire, PW = Pain Willingness.

less than 0.90. Thus, the internal consistency of the CPAQ and CPAQ-8 was thought to be excellent. The overall ICC values for the Chinese version of the CPAQ and CPAQ-8 were 0.92 (95% CI, 0.84–0.96) and 0.89 (95% CI, 0.77–0.95), respectively. As a result of the high value of the ICC, test–retest reliability was considered perfect, implying that there were no significant differences in the measures between 2 different testing sessions. Details are summarized in Table 7.

4. Discussion

In this study, the English version of the CPAQ was successfully translated into simplified Chinese and validated with excellent validity and reliability. Minor modifications were made during the cross-cultural adaptation to ensure that the translated Chinese version was applicable to Chinese individuals.

Particularly, most of the participants completed the questionnaires without any difficulties, which indicated that the Chinese version of the CPAQ could be acceptable for use in a clinical setting. All the 20 items had good item-total correlations, and scores for each item followed a normal distribution. It was unavoidable that a few items were missed by several participants, but this did not occur frequently. Therefore, all the items were preserved in the Chinese version, and the potential clinical utility of the Chinese version of the CPAQ and CPAQ-8 might be noteworthy. The mean score of the CPAQ acquired from the patients was 81.41 (out of 120), along with a mean score on the AE subscale (41.96 out of 60) and the PW subscale (39.45 out of

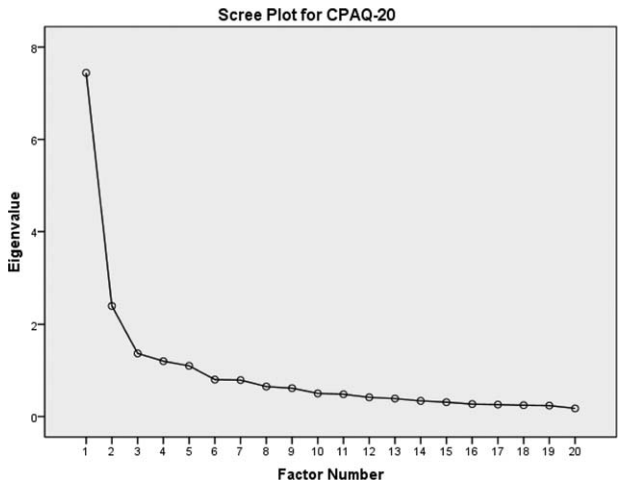

Figure 1. Scree plot indicating an optimal 2-factor solution for the Chinese version of the CPAQ. CPAQ = Chronic Pain Acceptance Questionnaire.

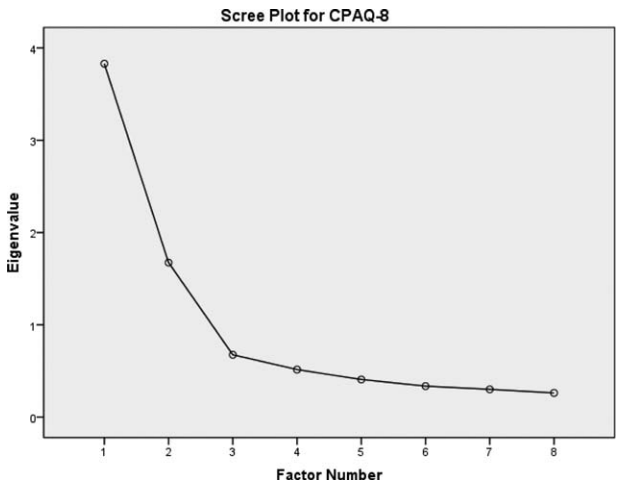

Figure 2. Scree plot indicating an optimal 2-factor solution for the Chinese version of the CPAQ-8. CPAQ = Chronic Pain Acceptance Questionnaire.

Table 3

Forced 2-factor solution by principal components loading and varimax rotation for the Chinese version of the CPAQ (n = 224).

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	7.442	37.212	37.212	7.442	37.212	37.212	4.998	24.990	24.990
2	2.399	11.993	49.205	2.399	11.993	49.205	4.843	24.214	49.205
3	1.370	6.850	56.054						
4	1.201	6.007	62.061						
5	1.099	5.497	67.559						
6	0.801	4.005	71.564						
7	0.790	3.949	75.513						
8	0.650	3.250	78.763						
9	0.616	3.078	81.841						
10	0.501	2.507	84.348						
11	0.484	2.418	86.765						
12	0.417	2.083	88.848						
13	0.390	1.950	90.798						
14	0.340	1.701	92.499						
15	0.311	1.557	94.056						
16	0.270	1.348	95.404						
17	0.259	1.296	96.700						
18	0.245	1.227	97.927						
19	0.238	1.191	99.118						
20	0.176	0.882	100.000						

CPAQ = Chronic Pain Acceptance Questionnaire.

60), suggesting that most of the patients recruited from the pain clinic had a medium level of pain acceptance. However, the mean scores for anxiety and depression from the HADS were 16.82 and 15.85 (out of 21), respectively, which strongly indicated that many participants already had anxiety and depression. If not treated effectively, the physical and psychological function of patients might worsen.

Both the CFA and PCA implicated a 2-factor structure of the Chinese version of the CPAQ and CPAQ-8, which had already been confirmed in other cultures, such as Germany,[19] Spain,[20] Australia,[8] Sweden,[21] Italy,[6] Finland,[22] Korea,[10] and Iran.[23] To explore the preliminary structure of the CPAQ and CPAQ-8, a PCA was conducted first. On the basis of the analysis of scree plots and eigenvalues, a 2-factor structure was suggested. One factor was AE and the other was PW. Each factor comprised a moderate amount of items, and each item only belonged to 1 factor. To test whether the 2-factor structure was a best-fit for the CPAQ and CPAQ-8, a CFA was then performed by evaluating goodness-of-fit in the proposed structure. As for the CPAQ, the fit indices from the CFA were not perfect, but we still considered them as acceptable because all the fit indices, including the NNFI, CFI, GFI, and RMSEA, were near the recommended criteria. Remarkably, the 2-factor structure in that CPAQ-8 had excellent goodness-of-fit. Thus, the 2-factor structure was confirmed to be suitable for the Chinese version of the CPAQ and CPAQ-8.

Internal consistency was tested by calculating the Cronbach α of the CPAQ and CPAQ-8. The Cronbach α for the CPAQ and CPAQ-8 were 0.90 and 0.84, respectively. The item-deleted Cronbach α of all 20 items was >0.90, and an excellent internal consistency was confirmed in both the CPAQ and CPAQ-8, which indicated that all the items measured the same property. An excellent test–retest reliability was also confirmed by ICC analysis, denoting that patients' responses to the CPAQ and CPAQ-8 were stable over time. Excellent internal consistency and test–retest reliability were also found in other studies including 2 Asian versions in Hong Kong (Cronbach α = 0.79, ICC = 0.79) and Korea (Cronbach α = 0.87, ICC = 0.85).

Ten prior hypotheses were proposed on the basis of empirical knowledge and previous studies. It has been suggested that the construct validity is considered excellent if 75% of the hypotheses are verified.[26] In our study, 9 of 10 hypotheses were verified by

Table 4

Forced 2-factor solution by principal components loading and varimax rotation for the Chinese version of the CPAQ-8 (n = 224).

Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.829	47.866	47.866	3.829	47.866	47.866	2.771	34.639	34.639
2	1.674	20.925	68.792	1.674	20.925	68.792	2.732	34.153	68.792
3	0.675	8.442	77.233						
4	0.515	6.436	83.670						
5	0.408	5.098	88.767						
6	0.336	4.199	92.967						
7	0.301	3.760	96.727						
8	0.262	3.273	100.000						

CPAQ = Chronic Pain Acceptance Questionnaire.

Table 5

Goodness of fit for the confirmatory factor analysis of a 2-factor structure for the Chinese version of the CPAQ and CPAQ-8.

	CMIN	DIF	CMIN/DF	NNFI	CFI	GFI	RMSEA	INFIT
CPAQ-20	570.330	167.000	3.415	0.757	0.813	0.796	0.104	0.815
CPAQ-8	31.150	17.000	1.832	0.962	0.982	0.967	0.061	0.982

CFI = comparative fit index, CMIN/DF = Satorra–Bentler scaled chi-square (S-Bχ 2)/degrees of freedom ratio, CPAQ = Chronic Pain Acceptance Questionnaire, GFI = goodness-of-fit index, NNFI = non-normed fit index, RMSEA = root mean square error of approximation.

testing the internal correlations between the Chinese version of the CPAQ, CPAQ-8, and other related questionnaires. Pain intensity only correlated mildly with the CPAQ and CPAQ-8, which was also reported in several other studies.[8,16,21] This unexpected result probably suggests that the acceptance of chronic pain is not simply a function of experiencing lower levels of pain, and further studies are needed to discuss how pain intensity influences pain acceptance. Both the CPAQ and CPAQ-8 had a moderately negative correlation with pain interference, indicating that patients with low levels of acceptance were generally bothered by unavoidable persistent pain.

Correlations were also found between acceptance and other emotions or physical performance, including anxiety, depression, and fear of movement. According to the fear-avoidance model suggested by Lethem, avoidant behaviors performed by patients who were afraid of experiencing feelings of pain were more likely to result in anxiety and depression, whereas the negative emotions would in turn reinforce patients' fear of pain.[35] Fear of pain could also be defined as a low level of acceptance, and the avoidant behaviors, resulting from fear of movement, could be measured by the TSK. Therefore, it was not difficult to understand that the CPAQ correlated negatively with the TSK. In

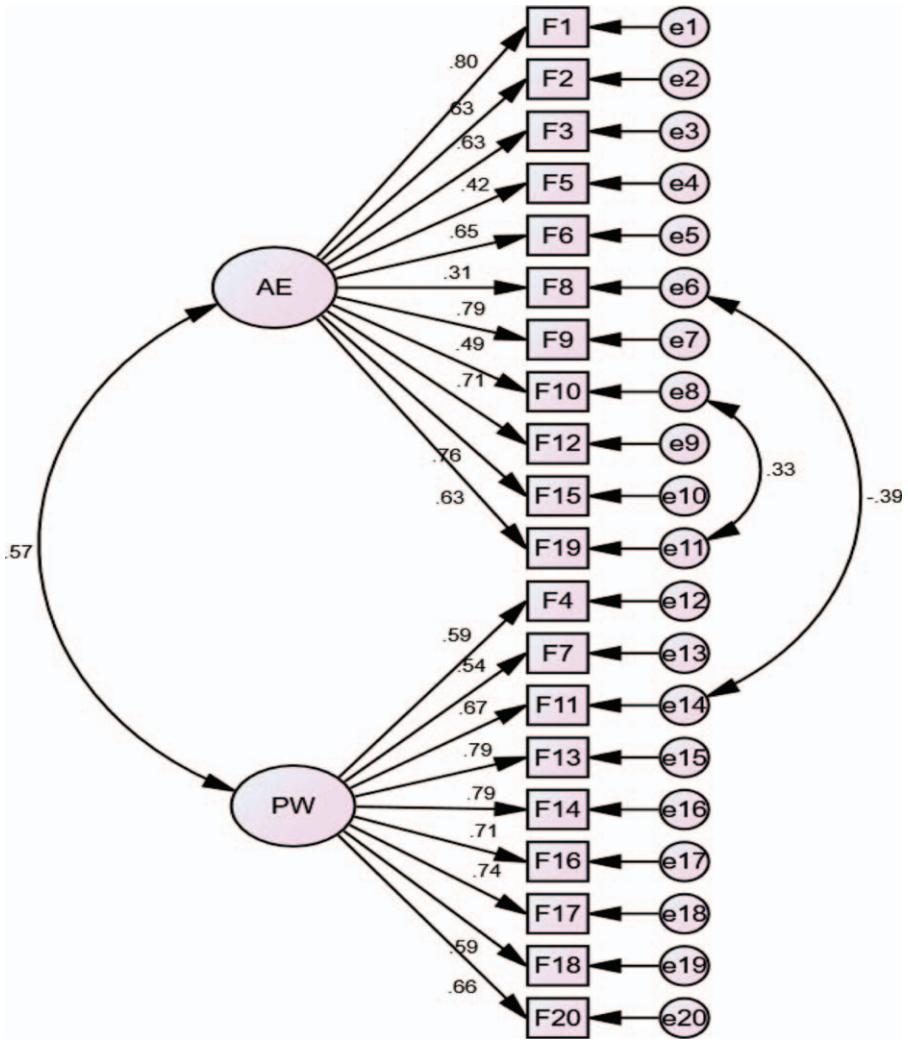

Figure 3. Two-factor structure of the Chinese version of the CPAQ (n = 224) with standardized parameter estimates. Numbers are mean standardized path coefficients. CPAQ = Chronic Pain Acceptance Questionnaire, AE = Activity Engagement, PW = Pain Willingness.

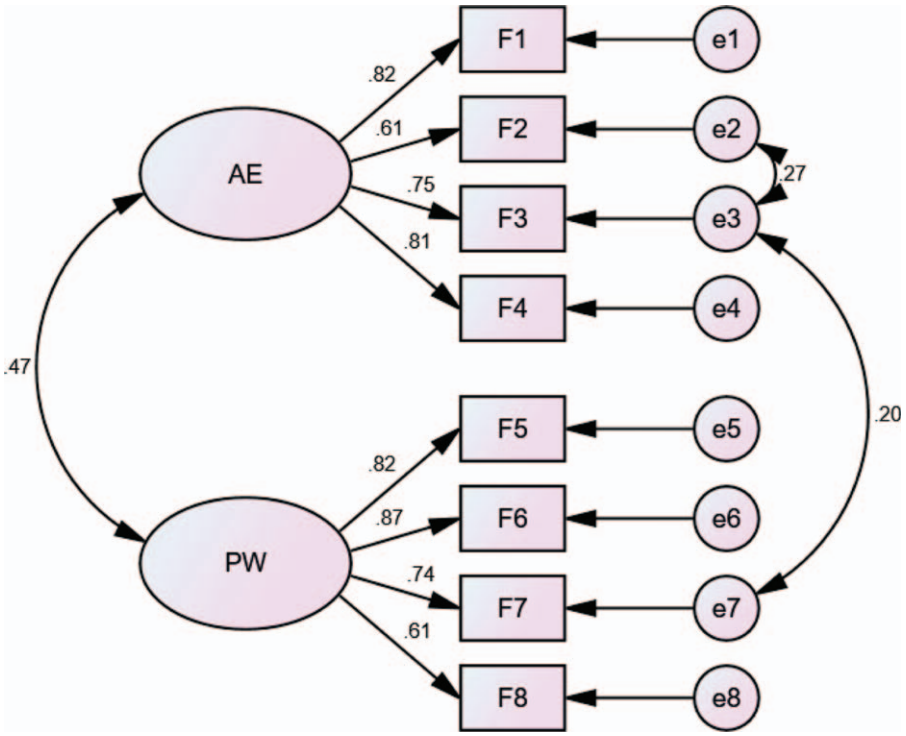

Figure 4. Two-factor structure of the Chinese version of the CPAQ-8 (n = 224) with standardized parameter estimates. Numbers are mean standardized path coefficients. CPAQ = Chronic Pain Acceptance Questionnaire, AE = Activity Engagement, PW = Pain Willingness.

addition, a study of a comparison between the CPAQ and the TSK showed that the CPAQ could explain more variance than the TSK in depression, pain intensity, life satisfaction, and disability.[36] Poppe et al[37] revealed that people with avoidant personality traits tended to have a lower level of acceptance, and this was mediated by catastrophizing. Further investigations should focus on the interactions among acceptance, avoidant behavior (fear of movement), and catastrophizing.

Compared with anxiety, depression had a relatively higher correlation with the CPAQ, CPAQ-8, AE, and AE-4. This finding was consistent with previous studies,[9,36] and it indicates that patients with lower levels of acceptance were more likely to develop depression. Clinicians or nurses should focus on the psychological status of these patients and give prompt interventions if needed. Moreover, the AE and AE-4 subscales correlated more highly with pain interference, anxiety, depression, and the TSK than the PW and PW-4 subscales, suggesting that the AE and AE-4 subscales might be a more powerful predictor for the outcomes than the PW and PW-4 subscales. Although validation of the CPAQ-8 in an Australian sample showed that the PW-4 and AE-4 were almost equivalent in predicting outcomes,[9] most research has supported that the AE and AE-4 had a stronger correlation with outcomes. Fish et al[8] found that the AE subscale contributed more to outcomes than the PW subscale, and the PW was not significantly correlated with depression. Korean researchers revealed that the AE subscale was a common predictor of all outcomes, and researchers from HK have suggested that the PW was only correlated with catastrophizing.[10,16] Thus, the crucial role of the AE and AE-4 subscales should be highly emphasized, and for the treatment of chronic pain, adjustment of AE rather than PW might be more effective.

Consistent with previous studies, the CPAQ and CPAQ-8 scores were associated with anxiety, depression, catastrophizing, satisfaction, and quality of life.[8,14,37] Acceptance might be a reliable predictor for important aspects of physical, psychological, and social functioning in patients with chronic pain. More recently, using Latent Class Analysis, a study conducted by Rovner et al suggested that patients with chronic pain could be divided into 4 subgroups (low acceptance, medium acceptance, high acceptance, and a special group with high AE and low PW) in terms of the levels of acceptance,[38] which was superior to the 3-subgroup structure suggested in the previous study.[39] Each subgroup was significantly correlated with specific patterns of physical and psychological function, providing valuable evidence for their treatment. Patients with lower scores (lower acceptance) on the CPAQ or CPAQ-8 have less satisfaction, more anxiety, more depression, and more fear of movement, than those with higher scores (higher acceptance). Accordingly, treatments aimed at symptom reduction would not settle the essential problem, whereas acceptance-based cognitive behavior therapies, such as Acceptance and Commitment Therapy (ACT), Functional Analytic Therapy, and Metacognitive Therapy, might be beneficial in improving the functional status of patients suffering from chronic pain.[40] It had been reported that the ACT inventions could result in a statistically significant increase in acceptance of pain and a medium effect size at the group level.[41] More and more evidence-based data have demonstrated that the role of acceptance in coping strategies for chronic pain are growing, and acceptance-based inventions are thought to be promising.[42,43] Clinicians should recognize the importance of psychological counseling and try to encourage patients to live and to pursue their own goals with less concern about feelings of pain. Meanwhile, patients themselves also need to become aware that

Table 6

Correlations between the Chinese version of the CPAQ and pain-related measures.

	CPAQ	AE	PW	CPAQ-8	AE-4	PW-4
Pain intensity	−0.29*	−0.30*	−0.19*	−0.27*	−0.24*	−0.20*
Pain interference	−0.56*	−0.61*	−0.32*	−0.51*	−0.53*	−0.31*
Anxiety	−0.60*	−0.57*	−0.46*	−0.54*	−0.50*	−0.39*
Depression	−0.64*	−0.68*	−0.41*	−0.56*	−0.61*	−0.30*
TSK	−0.59*	−0.54*	−0.49*	−0.49*	−0.45*	−0.36*

AE = Activity Engagement, CPAQ = Chronic Pain Acceptance Questionnaire, PW = Pain Willingness, TSK = Tampa Scale for Kinesiophobia.
* $P < 0.01$.

cognitive responses, such as beliefs, thoughts, or expectations, played a key role in the perception of chronic pain and therapeutic adjustment to pain.

Among the patients recruited to our study, most of them went to the pain clinic because of low back pain (LBP), which could lead to many degenerative lumbar disorders.[44,45] Usually, medications for LBP are limited, and most patients need surgical treatment.[46] However, surgery does not always reduce the extent of the pain, and the postoperative pain, due to its high prevalence among patients, has become a serious challenge.[47] Studies showed that in spite of the best medications and modern devices, a majority of patients still suffered from moderate to severe chronic pain after surgery.[48] In a study conducted among athletes after surgery for anterior cruciate ligament reconstruction, researchers found that lower pain acceptance scores during the 2-week postoperative period were associated with more severe depression scores at 6 months, and lower acceptance was also predictive of greater use of alcohol and other substances to cope with the stress related to the surgery and complications.[49] In contrast, patients with higher scores for pain acceptance are more likely to become satisfied with the effectiveness of surgery. Acceptance might be one of the predictors for patient satisfaction after lumbar spine surgery. Therefore, measurement of chronic pain acceptance is suggested before and after surgery, and inventions aiming at improving acceptance should be emphasized.

On the one hand, surgeons should evaluate patients' acceptance with the CPAQ or CPAQ-8 before surgery to identify those with lower acceptance scores. Both surgeons and nurses should carry out frequent cognitive education about pain and encourage more activities particularly for those with lower scores. By improving the acceptance of patients, these inventions might enhance the patients' tolerance for the operation and reduce the occurrence of postoperative pain. On the other hand, after surgery, the CPAQ or CPAQ-8 should also be used to recognize patients with a high risk of negative emotions such as depression. Providing regular cognitive education and advocating positive activity participation might be helpful strategies. Through precise evaluation and adequate adjustment, the effectiveness of treatment and patients' satisfaction might be greatly improved. Future researches are needed to explore the definite correlation between the scores of CPAQ or CPAQ-8 of patients suffering from operations and the therapeutic effectiveness of them. In addition, researches that aim at investigating the ways of psychological inventions and to what extent could psychological inventions improve the pain acceptance of patients are greatly required.

This study has several limitations. First, most of the participants recruited from the pain clinic in a tertiary hospital had suffered from severe and long-duration pain, thus the applicability of the Chinese version of the CPAQ and CPAQ-8 may be limited in those who experienced lower levels of pain. Further study should pay more attention to the samples from community clinics. Second, the participants we recruited did not receive interventions in the hospital before answering these questionnaires, and further study should measure the acceptance of patients after interventions. Another limitation was the sensitivity to change that was not determined due to the long-term follow-up required and the absence of a criterion standard for change in health status.[50] Thus, further studies are required to determine whether the Chinese version of CPAQ and CPAQ-8 can be applied in China as a tool to analyze the efficacy of interventions. Finally, because of the absence of a gold standard measure for acceptance, criterion validity cannot be examined.

In conclusion, a Chinese version of the CPAQ and CPAQ-8 was successfully developed with excellent validity and reliability. The scores on the CPAQ and CPAQ-8 might be a strong predictor for the physical and psychological function of patients with chronic pain, and the AE subscale was found to contribute more to outcomes than the PW subscale. In addition, to improve the satisfaction of surgery patients with the effectiveness of surgery, we recommend measuring patients' pain acceptance using the CPAQ or CPAQ-8 before and after the surgery. For patients with lower levels of acceptance, psychological interventions, including frequent cognitive education about pain and encouragement of AE, may be more effective than treatments that simply reduce symptoms. Finally, we suggested that as credible tools for the measurement of pain acceptance, the Chinese versions of the CPAQ and CPAQ-8 are appropriate to use in clinical settings or fundamental research in Mainland China.

Table 7

Internal consistency and test–retest reliability of the Chinese version of the CPAQ and CPAQ-8.

	Cronbach α	ICC (95% CI)
CPAQ	0.90	0.92 (0.84–0.96)
CPAQ-8	0.84	0.89 (0.77–0.95)

CI = confidence interval, CPAQ = Chronic Pain Acceptance Questionnaire, ICC = intraclass correlation coefficient.

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