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Validation of the Chronic Pain Acceptance Questionnaire-8 in an Australian Pain Clinic Sample

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Abstract

Background Recently, an 8-item short-form version of the Chronic Pain Acceptance Questionnaire (CPAQ-8) was developed predominantly in an internet sample. Further investigation of the factor structure in a multidisciplinary pain clinic sample is required. Investigation of the concurrent validity of the CPAQ-8 after accounting for the effects of variables commonly measured in the pain clinic setting is also necessary.

Purpose This study examines the factor structure and con-current validity of the CPAQ-8 in a sample of treatmentseeking patients who attended a multidisciplinary pain clinic.

Methods Participants were 334 patients who attended an Australian multidisciplinary pain service. Participants completed the CPAQ, a demographic questionnaire, and measures of patient adjustment and functioning.

Results Confirmatory factor analysis identified a two-factor 8-item model consisting of Activity Engagement and Pain Willingness factors (SRMR 0 0.039, RMSEA 0 0.063, CFI 0 0.973, TLI 0 0.960) was superior to both the CPAQ and CPAQ with an item removed. The CPAQ and CPAQ-8 total scores were highly correlated (r 0 0.93). After accounting for pain intensity, the CPAQ-8 was a significant predictor of depression, anxiety, stress, and disability. The subscales of the CPAQ-8 were both unique contributors to depression and disability in regression analyses, after accounting for pain intensity and kinesiophobia, and after accounting for pain intensity and catastrophizing.

Conclusions The CPAQ-8 has a sound factor structure and similar psychometric properties to the CPAQ; it may have clinical utility as a measure of pain acceptance in treatmentseeking, chronic pain patients.

Introduction

The Chronic Pain Acceptance Questionnaire (CPAQ) is a 20item scale used to assess two related behavioral processes, namely activity engagement and pain willingness [1, 2]. Since

2004, more than 90 studies have investigated acceptance of chronic pain, with the majority employing the CPAQ due to its strong psychometric properties [3]. The total score, as well as the subscales of pain willingness and activity engagement, predict disability, quality of life, and distress [1]. The CPAQ contributes unique variance to pain disability, anxiety, and depression when considered in the context of factors known to be associated with chronic pain such as self-efficacy, catastrophizing, and fear of (re)injury/movement [4, 5].

The CPAQ has undergone numerous revisions; the original 34-item questionnaire was developed by Geiser [6] based on the Acceptance and Action Question, with items modified to apply to chronic pain. A subsequent version of the CPAQ contained 27 items, and four factors [7]. Later, the CPAQ was refined to two factors and 20items following principal components analysis [1]. Since the development of the 20-item measure, confirmatory factor analysis (CFA) conducted by Vowles et al. [8] found support for the two-factor model (i.e., Activity Engagement and Pain Willingness). A more recent CFA conducted by Wicksell et al. [5] also found that the twofactor solution showed adequate fit to the data in a Swedish translation of the measure. However, the fit was significantly improved following

the removal of an item. The CPAQ has also been examined in relation to variables from distinct theoretical models of chronic pain that are not acceptance-based [4, 5]. For example, Wicksell et al. [5] found that the CPAQ explained more variance than the Tampa Scale of Kinesiophobia (TSK) towards pain intensity, depression, life satisfaction, and depression.

Recently, an eight-item version of the CPAQ (CPAQ-8) was developed based on a statistical analysis of items in an internet sample [9]. A clear advantage of the CPAQ-8 is brevity in a clinical setting. The two-factor structure requires further examination in an applied pain clinic setting with a treatment-seeking sample. The utility of the CPAQ-8 in an applied setting may, in part, be assessed by examining the relationship of the measure to key outcomes after accounting for variables commonly assessed in this setting. Both catastrophizing and kinesiophobia (fear of [re]injury/movement) are important constructs in the fear-avoidance model, which has become a dominant psychological model in pain research over the past 12 years [10]. The fear-avoidance model provides an account of the development and maintenance of depression and disability in chronic pain, and has received considerable empirical support [10]. Therefore, key variables from this model will provide robust comparison variables to test the utility of the CPAQ-8 in the prediction of depression and disability.

The present study sought to extend the work of Fish et al. [9] by further examining the factor structure and concurrent validity of the CPAQ-8 in a large treatment-seeking sample drawn from an Australian multidisciplinary pain clinic. We first employed CFA to undertake model comparisons between the 20-, 19-, and the 8-item CPAQ models; the concurrent validity and relationship to criterion variables after controlling for demographics and pain, catastrophizing, and then kinesiophobia was examined. Given that both catastrophizing, and then kinesiophobia have previously been reliably associated with depression and disability in chronic pain, any unique variance offered by the CPAQ-8 should represent a key index of research and clinical utility.

Method

Participants

Participants in this study were 334 adults with chronic pain (57.4 % female) who attended a public hospital-based pain clinic in Adelaide, Australia, for treatment. A total of 406 patients were invited to take part in the study and 82 % agreed to participate. A small percentage of participants lived alone (12.8 %). The mean age of participants was 46.2 (SD 0 11.9). At initial presentation, 13 % worked full-time, 21.9 % part-time, 5.5 % were in voluntary work, and 59.6 % were unemployed. In terms of education, 27 % had completed less than 12 years

of school, 27 % completed high school, 37 % had studied at university or other tertiary institution. For approximately 44 % of patients, the primary pain site was low back. In addition to low back, patients reported pain in the following locations: upper shoulders and limbs (16.3 %), head, face, and mouth (10.5 %), cervical spine (9.8 %), full body (9.8 %), lower limbs (9.8 %), thoracic spine (3.3 %), and pelvis and other locations (0.7 %). The mean duration of pain since onset was 97.5 months (SD0 119). The initiation of pain for approximately 65 % of participants was work-related. Other causes of injury were motor vehicle (12 %), cause unknown (14 %), and other (10 %).

Measures

Acceptance of Pain The Chronic Pain Acceptance Questionnaire (CPAQ) [1] has 20 items and two subscales: activity engagement (e.g., “I am getting on with the business of living no matter what my pain level is”) and pain willingness (e.g., “I would gladly sacrifice important things in my life to control this pain better”). Questions are rated on a scale from 0 (never true) to 6 (always true). The internal consistency has been reported as ranging from 0.78 to 0.83 [3]. The CPAQ-8 developed by Fish et al. [9] had internal reliabilities in the range of 0.77 to 0.89 in an internet sample and a sample from a number of sources [9].

Pain Intensity Pain intensity was measured on a Numerical Rating Scale (NRS) that ranged from 0 (no pain) to 10 (worst possible pain). Ratings were given for the average daily pain in the last week. The NRS is a valid and sensitive measure of pain intensity [11].

Pain Catastrophizing Pain catastrophizing was measured using the nine items of the pain response self-statement scale (PRSS) that relate to pain catastrophizing [12]. The questionnaire lists typical thoughts of people in pain (e.g., “I cannot stand this pain any longer”). Questions are rated on a six-point scale ranging from 0 to 5 with higher scores indicating more frequent catastrophizing when experiencing pain. The PRSS had good internal reliability in previous studies (0.92) [12].

Kinesiophobia The TSK is a 17-item scale that measures fear of (re)injury by physical activity [13, 14]. The questionnaire lists beliefs associated with fear of (re)injury (e.g., “Pain always means I have injured my body”). Questions are rated on a four-point scale ranging from 1 (strongly disagree) to 4 (strongly agree) with higher scores indicating higher fear of (re)injury. Total scores range from 0 (no fear) to 68 (high fear). The reliability and validity of the TSK has been established in a chronic pain population [14]. Cronbach’s alpha for the TSK in a previous study in a chronic pain population was 0.77 [14].

Functional Disability The Roland Morris Disability Questionnaire (RMDQ) is a 24-item scale that measures functional disability [15]. The items relate to a range of daily activities that patients may perceive are limited by pain. Total scores range from 0 (no disability) to 24 (severe disability). A modified version of the RMDQ was used in this study. References to specific injury sites were substituted with references to pain, to be suitable for use with all pain locations (e.g., “I walk more slowly because of my pain”). The reliability and validity of the modified measure has been established in a chronic pain population (α 0 0.92) [16].

Depression, Anxiety, and Stress The Depression Anxiety and Stress Scale 21 (DASS-21) is a measure of depression, anxiety, and stress consisting of 21 items [17]. The depression scale contains seven items. The scale does not include somatic symptoms and is therefore useful in chronic pain populations because it avoids confounding the measurement of depression with somatic symptoms that may relate to the pain problem. Items include “I couldn’t seem to experience any positive feeling at all” and “I felt I had nothing to look forward to”. The anxiety scale consists of seven items and includes autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. Items include “I experienced trembling (e.g., in the hands)” and “I felt I was close to panic”. The stress scale consists of seven items. Items include “I found it hard to wind down” and “I tended to over-react to situations”.

The internal consistency of the DASS subscales has been shown to be good in a non-clinical sample [17] (depression (α 0 0.91), anxiety (α 0 0.84), and stress subscales (α 0 0.88)) and in a chronic pain sample [18] (depression (α 0 0.95), anxiety (α 0 0.96), and stress (α 0 0.89)). The validity of the DASS generally, and in chronic pain populations specifically, has been demonstrated [17, 19].

Procedure

Participants completed assessment questionnaires at the initial assessment; questionnaires were completed while at the pain unit. The study was conducted in an outpatient pain clinic of a public hospital. Human ethical clearance was obtained from this hospital and from a university ethics review committee. Participants provided written consent.

Analytic Strategy

Statistical analyses were conducted using IBM SPSS AMOS version 19 and IBM SPSS Statistics version 19. First, a number of analyses were conducted to investigate the factor structure and internal consistency of the 20-item CPAQ, the 19-item CPAQ, and the 8-item version of the CPAQ. Absolute close-fit indexes (i.e., SRMR and RMSEA) were used to assess model fit. RMSEA values less than 0.06–0.08 and SRMR values less than 0.06 indicate acceptable fit

[20, 21]. Incremental close-fit indexes (i.e., CFI and TLI) greater than 0.95 indicate acceptable fit [21].

Second, concurrent validity of the CPAQ-8 was initially assessed by examining correlations between the CPAQ8 and criterion variables. Third, a series of regression anal-

yses were performed using the CPAQ-8 to investigate the prediction of criterion variables (i.e., depression, anxiety, stress, and disability) after controlling for background variables and pain intensity. Finally, a series of hierarchical regressions was conducted to assess the relationship between the CPAQ-8 and criterion variables relative to kinesiophobia, and then to assess the relationship between the CPAQ-8 and criterion variables relative to catastrophizing.

Results

Confirmatory Factor Analysis

The total dataset consisted of 344 participants. However, 16 of the 20 CPAQ items had between 1 and 9 missing observations. To determine whether the missing observations were missing completely at random (MCAR), Little's MCAR test was performed, which yielded $\chi2(261)$ 0 256.43, p 0 0.568, suggesting random missing data points. Consequently, an expectation-maximization approach to missing value imputation was undertaken.

Prior to conducting the analyses, the data were examined for multivariate outliers based on a procedure published by DeCarlo [22]. Small's omnibus test for multivariate normality was estimated at $\chi2(40)$ 0 468.90, $p < 0.001$, with approximately equal amounts of the multivariate non-normality due to both skewness ($\chi2(20)$ 0 194.19, $p < 0.001$) and kurtosis ($\chi2(20)$ 0 468.90, $p < 0.001$). Overall, these levels of multivariate skewness and kurtosis were not considered particularly large. Next, the data were examined for multivariate outliers. Based on an examination of the Mahalanobis distance squared values (visually in a plot, as well as a Bonferroni corrected $\chi2$ test), six cases were identified as multivariate outliers and removed from the dataset.

Confirmatory Factor Analysis: CPAQ (20 Items) As can be seen in Table 1 (top-half), the global factor model was a poor fit to the data, as demonstrated by absolute (SRMR 00.117, RMSEA 0 0.118) and incremental close-fit (CFI 00.639, TLI 0 0.597) indexes. The oblique two-factor model improved in fit but failed to meet recognized minimum fit requirements (SRMR 0 0.066, RMSEA 0 0.073, CFI 0 0.862, TLI 0 0.845). Consequently, the oblique two-factor model was not considered acceptably well-fitting. Although Model 2 (oblique two-factor

model) was not considered sufficiently well-fitting, the factor loadings were all positive, statistically significant, and of moderate magnitude. However, the Pain Willingness factor appeared to be noticeably weaker than the Activity Engagement factor based on the average factor loadings associated with each factor (Activity Engagement 0 0.60, Pain Willingness 0 0.54). Finally, the correlation between the activity engagement and pain willingness latent variables was estimated at r 0 0.40 ($p < 0.001$), indicating that higher levels of activity engagement are associated with higher levels of pain willingness.

Item 16 was removed from the CPAQ full-form for the purposes of evaluating a 19-item version of the inventory, in accordance with Wicksell et al. [5] and Fish et al. [9]. The removal of item 16 was associated with an improvement in model fit (Table 1), although the oblique two-factor model was still not acceptably well-fitting based on the absolute close-fit indices (CFI 0 0.896, TLI 0 0.882).

Confirmatory Factor Analysis: CPAQ-8 (8 Items) A confirmatory factor analysis was conducted to assess the twofactor model of the CPAQ-8. As can be seen in the bottom half of Table 1, the global factor model was not associated with acceptable levels of fit. Specifically, both the absolute (SRMR 0 0.141, RMSEA 0 0.216) and incremental close-fit indexes (CFI 0 0.661, TLI 0 0.525) suggested a poor fitting model. By contrast, the oblique two-factor model suggested a well-fitting model based on both the absolute close-fit index values (SRMR 0 0.039, RMSEA 0 0.063) and the corresponding incremental close-fit index values (CFI 0 0.973, TLI 0 0.960). The factor loadings were all positive, statistically significant, and of considerable magnitude (average factor loadings for activity engagement and pain willingness were 0.73 and 0.67, respectively). Finally, the correlation between the Activity Engagement and Pain Willingness factors was estimated at r 0 0.42 ($p < 0.001$), implying that 17.6 % of each latent variable's true score variance was shared.

Convergent Validity: CPAQ and CPAQ-8

The 20and 8-item total CPAQ scores were significantly correlated at r 0 0.93, indicating 86.5 % of the variance in the CPAQ was accounted for by the short-form (Table 2). Similarly, the corresponding activity engagement and pain willingness CPAQ and CPAQ-8 subscales correlated at r 0 0.92 and r 0 0.88, respectively.

Concurrent Criterion Validity with Criterion Variables

Table 2 contains correlations between the CPAQ and CPAQ8 scales and criterion variables. Overall, the correlations between the CPAQ-8 and criterion variables were similar in magnitude to the correlations between the CPAQ and criterion variables. Small correlations

were observed between both the CPAQ and CPAQ-8 scales and pain intensity. Means, standard deviations, and internal reliabilities for predictor variables and criterion variables are also presented in Table 2.

Prediction of Depression, Anxiety, Stress, and Disability After Controlling for Pain Intensity

Table 3 contains the hierarchical multiple regression for the CPAQ-8 predicting depression, anxiety, stress, and disability, after controlling for pain intensity. In accordance with previous studies that have investigated the concurrent validity of the CPAQ (e.g., Wicksell et al. [5]; McCracken [23]), background variables were tested for inclusion in each model as a block. A significance level of 0.05 was required for entry into the model. Variables that did not significantly contribute to the outcome measures were subsequently removed. A significance level of 0.10 was set for removal of the block of background variables. Age and education remained as significant predictors of anxiety. Background variables did not significantly predict the other outcomes when entered into step 1 of the regression model. The CPAQ-8 contributed significantly to depression, anxiety, stress, and disability after controlling for pain intensity. Standardized beta coefficients for activity engagement made significant contributions to all criterion measures, and were all larger in magnitude than the standardized beta coefficients for pain willingness. Pain willingness made significant contributions to all criterion measures except anxiety.

Contributions of CPAQ-8 and Catastrophizing to the Prediction of Depression and Disability when Controlling for Background Variables and Pain Intensity

Results of the regression analysis of the CPAQ-8 predicting depression and disability, after controlling for pain intensity and catastrophizing, are shown in Table 5. Background variables entered at step 1 did not meet criteria to be retained. Pain intensity at step 1 accounted for 8.7 % of variance in depression ($p < 0.001$) and 11.3 % of variance in disability ($p < 0 .001$). CPAQ-8 e nter ed before catas trophizing accounted for 18.9 % of variance ($p < 0.001$). Catastrophizing entered after CPAQ-8 accounted for 13.3 % of unique variance in depression ($p < 0.001$) and 1.6 % of unique variance in disability ($p < 0.014$). When the order of entry was reversed (see Table 5), catastrophizing accounted for 28 % of the variance in depression ($p < 0.001$) and 7.2 % of variance in disability ($p < 0.001$). CPAQ-8, when entered after catastrophizing, accounted for 4.1 % of unique variance in depression ($p < 0.001$) and 5.9 % of variance in disability ($p < 0.001$).

Discussion

The results provide support for the factor structure and validity of the CPAQ-8 in an Australian treatment-seeking sample. Partial support was found for the factor structure and validity of the CPAQ. The two-factor model of the CPAQ was a better fit to the data than a global factor model. The CPAQ with an item removed, as suggested by Wicksell et al. [5],

provided a better fit than the 20-item model proposed by McCracken et al. [1]. These results are in keeping with the findings of Wicksell et al. [5] in a Swedish sample, and Fish et al. [10] in an internet sample. These findings provide further support for the adoption of the 19item over the 20-item long form of the CPAQ.

The two-factor model of the CPAQ-8 was confirmed in a treatment-seeking sample, supporting the work of Fish et al. [9] and suggesting that the factor structure is generalizable to an applied pain clinic setting with treatment-seeking patients. The mean scores for both the CPAQ and CPAQ-8 in this study were lower than in both samples of Fish et al. [9], which contained patient data from a number of sources.

There was a significant correlation between the CPAQ and CPAQ-8 (r 0 0.93). Despite the high correlation between the CPAQ and CPAQ-8, the pattern of the relationships between CPAQ-8 subscales and criterion variables may differ to that of the relationship between CPAQ and criterion variables. Previous research has found support for stronger relationships between the activity engagement subscale and criterion variables than for relationships between the pain willingness subscale and criterion variables [4, 5]. In the present study, the pain willingness and the activity engagement scales of the CPAQ-8 were approximately equivalent in relation to criterion variables.

When pain intensity was accounted for, the CPAQ-8 was a significant predictor of depression, anxiety, stress, and disability. This finding implies that the CPAQ-8 has concurrent validity for a range of pain-related outcomes above that of pain intensity. After controlling for pain intensity, the CPAQ-8 explained more variance in depression, stress, and disability, than it did in relation to anxiety. The DASS anxiety scale measures panic-type anxiety that may have a weaker relationship to the behavioral pattern associated with pain acceptance than other measures (i.e., depression, disability, and stress). Either a more general measure of anxiety or a specific measure of pain-related anxiety may have yielded a different result.

Furthermore, pain intensity and variables from other theoretical perspectives (i.e., catastrophizing and kinesiophobia as measured by the TSK) were accounted for in an examination of the relationship between the CPAQ-8 and two keyoutcome variables, namely depression and disability. The subscales of the CPAQ-8 were both significant contributors to depression in one analysis, and to disability in a separate analysis, after accounting for pain intensity and kinesiophobia. Similarly, both subscales were significant contributors to both depression and disability, after controlling for pain intensity and catastrophizing. Both catastrophizing and kinesiophobia are important concepts in the fear-avoidance model [10]. Therefore, comparing the predictive validity of the CPAQ-8 to the predictive validity of catastrophizing and kinesiophobia is a robust test of the utility of the CPAQ-8 in an applied setting. In keeping with the findings of Wicksell et al. [5] when employing the CPAQ, the CPAQ-8 was shown to contribute more unique variance to depression than the TSK. The CPAQ-8 and the TSK contributed approximately equivalent

amounts of unique variance to outcomes in disability. By contrast, catastrophizing contributed a larger amount of unique variance to depression than the CPAQ-8. Nevertheless, the CPAQ-8 did contribute unique variance to depression above that of catastrophizing at a statistically significant level. Furthermore, after accounting for catastrophizing, the CPAQ-8 made a statistically significant contribution to disability; the CPAQ-8 made a larger unique contribution to disability than did catastrophizing. Taken together, these results indicate as the CPAQ-8 can be used in the prediction of adjustment variables, even after accounting for the influence of kinesiophobia or catastrophizing. Consequently, the results demonstrate that the CPAQ-8 measures a construct that is distinct from the domains measured by kinesiophobia and catastrophizing. This finding is of clinical significance given that both comparison variables are strongly linked in the literature to the outcome variables depression and disability (see Vlaeyen and Linton [10]).

The CPAQ-8 has application in pain clinic settings. Its brevity and strong association with mood and function make it an attractive choice to track responses to treatment. The measure may also have utility in the post-treatment period as a means to detect deterioration after treatment. The CPAQ-8 is sufficiently brief to be administered on a number of separate occasions and could be delivered via a device such as a web-enabled smart phone.

This study has some limitations. First, the concurrent variables were assessed by questionnaire, introducing the possibility of shared method variance inflating the association between the CPAQ-8 and criterion measures. Therefore, the construct validity of the CPAQ-8 could be more fully explored by examining the relationship between pain acceptance and physical performance measures such as timed-walk and sit-to-stand performance, or other objective measures such as health care utilization. Additionally, the present study did not assess the content validity of the CPAQ-8. In constructing the CPAQ-8, Fish et al. [9] selected items from the CPAQ based on statistical rather than theoretical grounds. A potential downside of employing a statistical process to select items is that the CPAQ-8 may not adequately capture the breadth of the pain acceptance construct. However, inspection of the CPAQ-8 items indicates that the items that were retained do capture the concepts expressed in the CPAQ.

Future research could examine the content validity of the CPAQ-8 by obtaining expert opinions on whether the measure captures the breadth of the pain acceptance construct. Additionally, the use of the CPAQ-8 in processes of change research remains unclear. Due to the smaller number of items, the sensitivity to change of the CPAQ-8 may be less than that of the CPAQ. Pain acceptance is understood to be comprised of two parts that operate together. Activity engagement involves engagement in valued activities and pain willingness involves disengagement from pain [24]. The pain willingness items of both the CPAQ and the CPAQ8 are negatively keyed, whereas the activity engagement items are positively keyed. The positive and negative wording of the respective subscales may contribute to the two

factors being identified as distinct factors. For example, previous research has identified that an acquiescence bias may influence the emergence of separate factors of negatively keyed items during factor analysis [25]. Furthermore, Schmitt and Stults [26] showed that careless responding may lead to the emergence of two factors when reverse scoring is directly related with only one of the factors. Future research could explore a balanced version of the CPAQ and CPAQ-8, with an equal number of positively and negatively worded items in both scales. However, caution is required in the wording of items to retain the engagement and disengagement aspects of pain acceptance. Future research could also seek to validate the CPAQ-8 in other clinical populations such as fibromyalgia and cancer pain.

The CPAQ-8 appears to have great promise as a measure of pain acceptance in chronic pain treatment-seeking samples. The eight-item short-form measure was a better fit to the data in a treatment-seeking sample than either the 20or 19-item long form. Furthermore, the CPAQ-8 accounted for unique variance in depression, anxiety, stress, and disability after accounting for pain intensity. After first accounting for pain intensity and kinesiophobia and then pain intensity and catastrophizing, the CPAQ-8 was a unique predictor of depression and disability. The brevity of the measure lends itself to use in tracking progress in multidisciplinary pain treatment.

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