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ORIGINAL REPORT

PSYCHOMETRIC PROPERTIES OF THE 8-ITEM CHRONIC PAIN ACCEPTANCE QUESTIONNAIRE (CPAQ-8) IN A SWEDISH CHRONIC PAIN COHORT

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Background: **Acceptance and Commitment Therapy for chronic pain has good empirical support. Pain acceptance is most often assessed with the Chronic Pain Acceptance Questionnaire (CPAQ). Recently a shorter 8-item version, the CPAQ-8, was developed.**

Objectives: **To further validate the CPAQ-8 in a Swedish context and to test its sensitivity to treatment effects, an as-yet unknown property of the instrument.**

Methods: **A total of 891 patients completed the CPAQ, along with scales for anxiety and depression (Hospital Anxiety and Depression scale), kinesiophobia (Tampa Scale for Kinesiophobia) and quality of life (Short Form-36). Confirmatory factor analyses were performed to examine the factor structure. Convergent validity was tested with Pearson's correlations. Changes over time were evaluated with paired *t*-test.**

Results: **The confirmatory factor analyses showed that the CPAQ 2-factor model had a better fit compared with the 1-factor model, both for the 8- and 20-item versions. All CPAQ-8 scales demonstrated good internal consistency (alpha ≥0.80). They also correlated significantly with related constructs, supporting convergent validity. The CPAQ-8 explained a large share of the total variance in CPAQ-20 and was also able to track rehabilitation changes (large effect size, *d* = 0.89).**

Conclusion: **CPAQ-8 demonstrated good psychometric properties and sensitivity to rehabilitation changes. Further research that considers other cultural contexts may lead enhance the applications of this instrument.**

Key words: behavioural sciences; pain measurement; psychometrics; rehabilitation.

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INTRODUCTION

The theoretical framework behind Acceptance and Commitment Therapy (ACT) (1) is increasingly applied to chronic pain. One of the key processes in ACT, and the one that has been most extensively investigated, is acceptance (e.g. 2–4). Within the process of acceptance the concept of coping with pain is reframed, from a predominant focus to control pain and related psychological experiences to a focus that includes regulating pain or being open to pain, depending on which response is most effective for the purpose at hand. Acceptance includes flexible engagement in value-directed activities, which may include pain as part of the engagement, without struggling for pain control. This process, part of a wider process called psychological flexibility, is associated with lower levels of depression, higher psychological and physical function and better overall health and quality of life (2, 3, 5–8).

Pain acceptance is most often assessed with the Chronic Pain Acceptance Questionnaire (CPAQ) (7, 9). The CPAQ has 20 items and yields 2 subscales: Activity Engagement (AE), the degree to which the person engages in activities with pain present, and Pain Willingness (PW), the degree to which the person refrains from attempts to avoid or control painful experiences. Evidence shows that the CPAQ is coherent with ACT processes and concepts, useful in clinical practice (8) and psychometrically robust (10). It has been translated and validated into German (11), Spanish (12), Chinese (13) Swedish (14), Persian (15) and Korean (16).

Treatment providers and researchers often seek shorter and more time efficient means of obtaining data from patient reports. Hence, a shorter version of the CPAQ was recently developed (17). The result, an 8-item version of the instrument (CPAQ-8) tested in different contexts, appears to have good psychometric properties and the same 2-factor structure as the original (17–19). However, its sensitivity to treatments effect is as yet unknown property of the instrument (10, 19).

In Sweden the CPAQ is included in the Swedish Quality Registry for Pain Rehabilitation (SQRP), which gathers data from the majority of the rehabilitation departments for clinical use, quality control, and research. A shorter version of the CPAQ in Swedish would be very useful, as the burden on patients could potentially be reduced.

The specific aims of this study were to further validate the CPAQ-8, to test the reliability of findings from earlier research, and to test the generality to another country (Sweden) and its culture and language. An additional aim was to test the sensitivity of the CPAQ-8 to treatment effects.

MATERIALS AND METHODS

Sample and setting

The patients included in this study were from the Multidisciplinary Pain and Rehabilitation Centre at the University Hospital in Linköping, in the south-eastern region of Sweden. The centre has a behavioural-medicine approach and is specialized in vocational, multi-professional pain assessments and rehabilitation for patients with heterogeneous chronic pain conditions.

Between May 2009 and April 2011, 1,180 patients with chronic non-cancer pain conditions were referred to the centre, mainly from primary healthcare and occupational healthcare centres in both urban and rural areas. Only patients with complete data for the CPAQ-20 were selected ($n = 891$). Subsequently, 91 of these participants underwent ACT-based interprofessional rehabilitation and their data was used to examine the sensitivity to change of the CPAQ.

Before the first assessment all patients gave informed consent to be included in the SQRP. Permission to conduct the study was obtained from the Regional Ethics Board in Gothenburg (815-12).

Measures

SQRP is a national registry that has aggregated data since 1998 including all patients referred to the majority of the rehabilitation clinics. It is authorized and supported economically by the Swedish Association of Local Authorities and Regions (SALAR). Eighty percent of the pain specialty clinics (20 clinics) in the country report to this registry.

Included in this study are a subset of the instruments from the SQRP and the socio-demographic data: education, work status, sick leave or insurance situation, diagnoses and pain-specific variables such as pain duration (days), frequency, and localizations (body parts). The instruments used in this study are described below.

Chronic Pain Acceptance Questionnaire (7). A 20-item scale with 2 subscales: "Activity Engagement" (score range 0–66) and '"Pain Willingness" (score range 0–54). All items are rated on a scale from 0 (never true) to 6 (always true). The CPAQ-20 appears reliable and valid both in English and Swedish (7, 14). In this study the focus is on the 8 items of the scale that composed the shorter version (CPAQ-8) derived from Fish et al. (17, 19) and further examined by Baranoff et al. (18). In the present study, the internal consistency of the scale was good ($\alpha = 0.80$).

Hospital Anxiety and Depression scale (HAD) (20). A self-rating scale in which the severity of anxiety and depression is rated by 7 questions for each adnd on a 4-point scale. Both with a score range of 0–21, where higher values reflect more depression and or anxiety (20–22). It has been developed for non-psychiatric hospital settings and excludes items that might reflect somatic complaints. The scale covers a period of the previous few days. The Swedish translation has shown acceptable psychometric properties (23).

Short Form-36 survey questionnaire (SF-36) (24). This questionnaire measures health-related quality of life (QoL). It has 36 questions that yield an 8-scale profile of functioning, health, and well-being scores (Physical Functioning, Role-Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role-Emotional and Mental Health) as well as 2 psychometrically-derived summary clusters, the Physical Component and the Mental Component Summary (PCS and MCS). SF-36 has shown good psychometric properties in different language versions and different samples (25).

Tampa Scale for Kinesiophobia (TSK) (26). This scale measures fear of pain and re-injury (27). The items are rated on a 4-point Likert scale from "strongly disagree" to "strongly agree". The total score has a range from 17 to 68, where scores higher than 36 for women and 38 for men indicate high pain-related fear (28). The TSK appears to be a reliable assessment tool for chronic pain (27, 29). Roelofs' study (28) included Dutch, Canadian, and Swedish samples with several different pain types and demonstrated that the factor structure was stable across pain diagnoses and nationalities.

Statistical analyses

The first step in examining the psychometric properties of the CPAQ-8 was to investigate the distribution of scale scores using D'Agostino test (30) and Q-Q plots.

Although the CPAQ is based on rank ordered data (the items), parametric statistics were used to maintain a consistent analytical approach through the evaluation of the psychometric properties of the CPAQ-8, and with previous investigations of the instrument (7, 14, 17–19). Some of the commonly used statistical approaches in instrument development and validation for instruments of this kind such as Cronbach's alpha, item-total correlations and several factor analytical models, rely on the assumption of normally distributed and continuous data (31). To avoid false conclusions, tests have (when possible) been verified with non-parametric statistics.

To test homogeneity, item-total correlations (ITC) corrected for overlaps was conducted. Values above 0.4 were seen as acceptable (31). Internal consistency was assessed using Cronbach's alpha (32) and a 95% confidence interval (95% CI) around the alpha value was calculated using bootstrapping with 1,000 replications.

Confirmatory factor analyses (CFA) were used to evaluate the dimensionality of the CPAQ. To evaluate and compare the factor structure of CPAQ-8 and CPAQ-20, 1- and 2-factor models were analysed for each version of the scale. Factor analyses were conducted using maximum likelihood estimation. Bootstrapping with 1,000 replications was used since the assumption of multivariate normality was violated (33). Different measures were used to evaluate model fit in terms of absolute fit, parsimony correction, and comparative fit. Besides χ^2 goodness-of-fit, the root mean-square-error-of-approximation (RMSEA), Tucker-Lewis index (TLI), comparative fit index (CFI), goodness-of-fit index (GFI), and adjusted goodness-of-fit index (AGFI) were used. RMSEA values less than 0.05 have traditionally indicated close approximate fit, between 0.05 and 0.08 have indicated acceptable fit, and over 0.10 poor and unacceptable fit (34). Currently a value of 0.06 or less is seen as acceptable (34–36). The TLI, CFI, GFI and AGFI have a possible range between 0 and 1, values close to 0.95 or higher indicate a good fit. Akaike information criteria (AIC) and a χ^2 difference test were used to compare different models. Lower values of AIC represent better fit (33, 37).

To evaluate construct validity in terms of convergent validity, the CPAQ scores were correlated with SF-36, HAD and TSK. To support convergent validity the Pearson's correlation coefficients were not expected to be too weak (< 0.3) or too strong (> 0.9).

Sensitivity, in terms of the ability of CPAQ to detect change, was evaluated by comparing pre- and post- acceptance-based rehabilitation scores as well as SF-36, HAD and TSK, to analyse if the CPAQ reflects change when it also occurs in these key outcomes. For this purpose, paired *t*-tests and Cohen's *d* effect sizes were calculated for both CPAQ-20 and CPAQ-8 (38). For the same purpose, linear regression analyses were performed in order to explore how much of the variance of the CPAQ-20 was explained by the CPAQ-8.

The statistical analyses were conducted with SPSS Statistics 19 and SPSS AMOS 19 (IBM Corporation, Somers, NY, USA) as well as STATA 12.1 (StataCorp, College Station, TX, USA).

Table I. *Socio-demographics and pain characteristics (*n = *891)*

Variable	
Age, years, mean (SD)	47.5 (14)
Women, %	66.1
Born in Sweden, %	82.6
Education, %	
Elementary school	26.3
High school education	46.8
University education	18.1
Other education	5.7
Unknown	3.1
Living alone (*n* = 779), %	26.8
Sickness benefit 100%, %	13.1
Working/studying 100% (*n* = 828), %	29.2
More than 4 medical visits (past year), %	63.5
Pain severity (0–6), mean (SD)	4.5 (1.0)
Pain duration (days) (*n* = 785), mean (SD)	3,037 (3,440)
Persistent pain duration (days) (*n* = 39), mean (SD)	2,488 (3,179)
Days since occupationally active (*n* = 394), mean (SD)	2,388 (3,247)
Number of pain locations (0–36) (*n* = 888), mean (SD)	12.5 (8.2)
Pain localizations (*n* = 867), %	
Head and face	5.7
Neck, shoulders and upper limbs	28.5
Upper back and chest	4.2
Lower back	15.9
Hips and lower limbs	13.8
Abdomen	4.1
Widespread pain[a]	27.9

[a]Pain is not localized in one area; it varies/spreads around several body regions.
SD: standard deviation.

RESULTS

Socio-demographics and pain characteristics

The socio-demographics and pain characteristics of the investigated cohort of patients with chronic pain conditions are summarized in Table I.

Distribution of scale scores

The total scores for the CPAQ-8 and CPAQ-20 were statistically and graphically normally distributed. In contrast, all subscale scores deviated significantly from a normal distribution according to the D'Agostino test for normality ($p < 0.05$). However, the scores were graphically close to a normal distribution for all subscales even if the means indicated a small positive skewed distribution. The normal Q-Q plots showed a common pattern for all CPAQ subscales, and they all followed the normal distribution well except for the extreme tails, although no tendency of floor or ceiling effects was found (Table II).

Homogeneity and internal consistency reliability

The corrected ITC for the total CPAQ-8 ranged from 0.41 to 0.61 and its subscales from 0.56 to 0.73 and 0.45 to 0.60 for AE and PW, respectively (Table II). The ITCs for the total CPAQ-20 ranged between –0.12 and 0.67, 7 items did not reach the critical level of 0.4 (items 4, 5, 7, 8, 11, 16, 20). The ITCs for the subscales ranged from 0.41 to 0.75 for AE and 0.15–0.60 for PW. Items that did not reach the level of item-total correlations

Table II. *Item statistics for the Chronic Pain Acceptance Questionnaire (CPAQ) (*n = *891)*

CPAQ-20 item no. (CPAQ-8 item no.)		Mean (SD)	ITC CPAQ-8			ITC CPAQ-20		
			Total	AE	PW	Total	AE	PW
1 (1)	I am getting on with the business of living no matter what my level of pain is.	2.71 (1.69)	0.503	0.601		0.550	0.623	
2	Life is going well, even though I have chronic pain.	2.24 (1.59)				0.666	0.731	
3	It is OK to experience pain.	1.90 (1.71)				0.405	0.414	
4	I would gladly sacrifice important things in my life to control this pain better.	2.60 (1.82)				0.301		0.322
5	It's not necessary for me to control my pain in order to handle my life well.	2.06 (1.80)				0.350	0.401	
6 (2)	Although things have changed, I am living a normal life despite my chronic pain.	2.62 (1.83)	0.602	0.728		0.660	0.745	
7	I need to concentrate on getting rid of pain.	2.10 (1.79)				0.250		0.392
8	There are many activities I do when I feel pain.	2.75 (1.90)				0.367	0.419	
9 (3)	I lead a full life even though I have chronic pain.	2.38 (1.89)	0.614	0.732		0.670	0.750	
10	Controlling pain is less important than any other goals in my life.	2.28 (1.79)				0.524	0.546	
11	My thoughts and feelings about pain must change before I can take important steps in my life.	2.91 (1.89)				0.386		0.479
12	Despite the pain, I am now sticking to a certain course in my life.	2.36 (1.80)				0.649	0.736	
13 (4)	Keeping my pain level under control takes first priority whenever I'm doing something.	2.56 (1.71)	0.418		0.570	0.442		0.596
14 (5)	Before I can make any serious plans, I have to get some control over my pain.	2.49 (1.81)	0.569		0.601	0.564		0.611
15 (6)	When my pain increases, I can still take care of my responsibilities.	2.31 (1.74)	0.522	0.564		0.554	0.612	
16	I will have better control over my life if I can control my negative thoughts about pain.	3.15 (1.81)				–0.117		0.156
17 (7)	I avoid putting myself in situations where my pain might increase.	1.91 (1.61)	0.426		0.488	0.418		0.480
18 (8)	My worries and fears about what pain will do to me are true.	2.46 (1.91)	0.414		0.448	0.454		0.527
19	It's a relief to realize that I don't have to change my pain to get on with my life.	2.06 (1.82)				0.408	0.483	
20	I have to struggle to do things when I have pain.	1.25 (1.37)				0.397		0.312

ITC: item-total correlations; Total: total scale of CPAQ-20 or CPAQ-8; AE: Activity Engagement subscale; PW: Pain Willingness subscale.

Table III. *Goodness-of-fit indices for the 1- and 2-factor models of Chronic Pain Acceptance Questionnaire (CPAQ)-8 and CPAQ-20 (*n = *891)*

	CPAQ-8		CPAQ-20	
Model	1-factor	2-factor	1-factor	2-factor
χ^2	229.84*	65.54*	1,737.97*	718.71*
df	20	19	170	169
χ^2/df	11.429	3.449	10.223	4.253
RMSEA	0.109	0.052	0.102	0.060
RMSEA 90% CI	0.096–0.121	0.039–0.067	0.097–0.106	0.056–0.065
TLI	0.618	0.911	0.711	0.580
CFI	0.727	0.939	0.741	0.626
GFI	0.907	0.973	0.785	0.844
AGFI	0.832	0.950	0.734	0.806
AIC model	261.840	99.536	1,817.969	800.710

*$p < 0.001$.

χ^2: chi-square; df: degrees of freedom; χ^2/df: ratio that indicates goodness of fit of the model; RMSEA: root-mean-square-error-of-approximation (< 0.06 indicates acceptable fit) TLI: Tucker-Lewis index; CFI: comparative fit index; (> 0.95 is considered as a good fit); GFI: goodness-of-fit index; AGFI: adjusted goodness-of-fit index (range from 0 to 1, where values close to 1 are indicative of better fit); AIC: Akaike information criteria (values closer to 0 indicate better fit).

at 0.4 (item 4, 7, 16, 20) belonged exclusively to the PW subscale, and item 16 was the most problematic (Table II).

A satisfactory level of internal consistency was demonstrated by the CPAQ-8, with an alpha value of 0.80 (95% CI 0.78–0.82) for the total scale and 0.83 (95% CI 0.81–0.85) and 0.73 (95% CI 0.70–0.76) for the AE and PW subscales, respectively. The CPAQ-20 showed similar alpha values, with an alpha value of 0.86 (95% CI 0.84–0.87) for the total scale and 0.88 (95% CI 0.86–0.89) and 0.74 (95% CI 0.72–0.77) for the AE and PW subscales, respectively.

Dimensionality

The CFA showed that CPAQ is a multidimensional scale (Tables III and IV). All goodness-of-fit indices showed an unsatisfactory fit between the model and data for the 1-factor model, both for CPAQ-8 and CPAQ-20 (Table III). However, the 1-factor

Table IV. *Factor loadings and squared multiple correlations R2 for the 1- and 2-factor models of Chronic Pain Acceptance Questionnaire (CPAQ) (*n = *891)*

		CPAQ-8, loading (R^2)			CPAQ-20, loading (R^2)		
		1-factor model	2-factor model		1-factor model	2-factor model	
CPAQ-20 item no. (CPAQ-8 item no.)		Total	AE	PW	Total	AE	PW
1 (1)	I am getting on with the business of living no matter what my level of pain is.	0.63 (0.39)	0.64 (0.41)		0.68 (0.46)	0.71 (0.50)	
2	Life is going well, even though I have chronic pain.				0.81 (0.65)	0.83 (0.68)	
3	It is OK to experience pain.				0.42 (0.17)	0.50 (0.25)	
4	I would gladly sacrifice important things in my life to control this pain better.				0.25 (0.06)		0.38 (0.14)
5	It's not necessary for me to control my pain in order to handle my life well.				0.41 (0.17)	0.50 (0.25)	
6 (2)	Although things have changed, I am living a normal life despite my chronic pain.	0.77 (0.60)	0.83 (0.68)		0.82 (0.67)	0.87 (0.75)	
7	I need to concentrate on getting rid of pain.				0.14 (0.02)		0.53 (0.29)
8	There are many activities I do when I feel pain.				0.44 (0.19)	0.44 (0.20)	
9 (3)	I lead a full life even though I have chronic pain.	0.81 (0.65)	0.84 (0.71)		0.82 (0.68)	0.86 (0.73)	
10	Controlling pain is less important than any other goals in my life.				0.55 (0.31)	0.64 (0.40)	
11	My thoughts and feelings about pain must change before I can take important steps in my life.				0.27 (0.08)		0.58 (0.34)
12	Despite the pain, I am now sticking to a certain course in my life.				0.80 (0.67)	0.83 (0.68)	
13 (4)	Keeping my pain level under control takes first priority whenever I'm doing something.	0.61 (0.37)		0.75 (0.56)	0.29 (0.08)		0.77 (0.59)
14 (5)	Before I can make any serious plans, I have to get some control over my pain.	0.79 (0.63)		0.82 (0.67)	0.45 (0.21)		0.86 (0.74)
15 (6)	When my pain increases, I can still take care of my responsibilities.	0.61 (0.37)	0.60 (0.36)		0.65 (0.42)	0.64 (0.41)	
16	I will have better control over my life if I can control my negative thoughts about pain.				–0.21 (0.04)		0.22 (0.05)
17 (7)	I avoid putting myself in situations where my pain might increase.	0.54 (0.30)		0.56 (0.32)	0.32 (0.10)		0.62 (0.39)
18 (8)	My worries and fears about what pain will do to me are true.	0.51 (0.26)		0.51 (0.26)	0.35 (0.12)		0.69 (0.47)
19	It's a relief to realize that I don't have to change my pain to get on with my life.				0.49 (0.24)	0.56 (0.32)	
20	I have to struggle to do things when I have pain.				0.37 (0.14)		0.56 (0.32)

AE: Activity Engagement subscale; PW: Pain Willingness subscale.

model for CPAQ-8 showed satisfactorily high factor loadings (0.51–0.81) in contrast to CPAQ-20. Eight items (4, 7, 11, 13, 16–18, 20) in CPAQ-20 had factor loadings < 0.40, of which one (item 16) was negatively associated with the factor. All problematic items were identified as belonging to the PW subscale (Table IV). Despite incongruent findings with regard to model fit, AIC as well as the χ^2_{diff} test ($\chi^2(150) = 1508.13$, $p < 0.001$) the short version is a more appropriate measurement model compared with the longer version of CPAQ.

The 2-factor model demonstrated a significantly better fit between the model and data compared with the 1-factor model, both for CPAQ-8 ($\chi^2(1)=164.30$, $p < 0.001$) and CPAQ-20 ($\chi^2(1)=1019.26$, $p < 0.001$). The CPAQ-8 2-factor-model demonstrated better fit in all evaluated indices, but TLI and CFI did not reach the desired level of ≥ 0.95 (Table III). The factor loadings for the AE subscale were satisfactory for both CPAQ-8 and CPAQ-20 (0.60–0.84 and 0.44–0.87, respectively). The PW subscale for CPAQ-8 also showed satisfactorily high factor loadings (0.51–0.82), while items 4 and 16 in CPAQ-20 still had problems with factor loadings < 0.40 (Table IV). All model fit indices, AIC and χ^2_{diff} test ($\chi^2(150) = 653.17$, $p < 0.001$) supported CPAQ-8 as achieving a better measurement model than the CPAQ-20.

Convergent validity

Convergent validity was supported in correlation analyses, CPAQ scores generally correlated with QoL (SF-36), anxiety and depression (HAD), and pain-related fear (TSK) (Table V). An exception was the PW subscale, which showed a weak correlation ($r < 0.3$) with some of the SF-36 subscales (PF: Physical Function; RP: Role Physical; BP: Bodily Pain; GH: General Health; VT: Vitality; RE: Role Emotional and PCS) and to the depression scale from the HAD. However, the correlation pattern and the significance level was the same for CPAQ-8 and the CPAQ-20.

Table VI. *Correlations between the Chronic Pain Acceptance Questionnaire (CPAQ)-8 and CPAQ-20 scales (*n = *891)*

Scales/subscales	CPAQ-8 Total	CPAQ-8 AE	CPAQ-8 PW
CPAQ-20 Total	0.921*	0.824*	0.729*
CPAQ-20 AE	0.756*	0.930*	0.395*
CPAQ-20 PW	0.762*	0.312*	0.900*

*$p < 0.01$.
AE: Activity Engagement subscale; PW: Pain Willingness subscale.

The scores between the both versions of CPAQ were highly correlated (≥ 0.9). The weakest correlations were demonstrated between the PW and AE subscales (Table VI).

Sensitivity

The sensitivity of the CPAQ-8 was similar to CPAQ-20 (Table VII). The effect sizes for the pre and postscores (Table VII) measured by the CPAQ-20 was of larger size ($d = 0.70$) than the one derived from the CPAQ-8 ($d = 0.55$). The AE subscales reflected medium effect size; the PW subscales showed small effects. Improvements were also demonstrated for all SF-36 subscales, HAD and TSK, although not all were statistically significant (Table VII).

The CPAQ-8 scales were able to explain over 80% of the total variance in the CPAQ-20. The CPAQ-8 explained 85% of the variance for the CPAQ-20 total scale ($\beta = 2.13$, $t(890) = 70.42$, $p < 0.001$), 81% for the CPAQ-20 PW subscale ($\beta = 1.55$, $t(890) = 61.47$, $p < 0.001$), and 87% for the CPAQ-20 AE subscale ($\beta = 2.10$, $t(890) = 75.72$, $p < 0.001$).

DISCUSSION

The purpose of the present analysis was to evaluate a previously developed short version of the CPAQ in a different context,

Table V. *Convergent validity based on Pearson's correlation (pairwise deletion) between the CPAQ and SF-36, HAD and TSK (*n = *891)*

Measures	Scales/subscales	CPAQ-8 Total	CPAQ-20 Total	CPAQ-8 AE	CPAQ-20 AE	CPAQ-8 PW	CPAQ-20 PW
SF-36	PF	0.398*	0.402*	0.422*	0.413*	0.255*	0.212*
	RP	0.357*	0.377*	0.402*	0.367*	0.214*	0.235*
	BP	0.447*	0.495*	0.502*	0.501*	0.268*	0.272*
	GH	0.411*	0.448*	0.451*	0.441*	0.270*	0.265*
	VT	0.350*	0.391*	0.465*	0.431*	0.155*	0.164*
	SF	0.511*	0.543*	0.573*	0.546*	0.313*	0.302*
	RE	0.392*	0.411*	0.378*	0.358*	0.292*	0.310*
	MH	0.477*	0.520*	0.497*	0.493*	0.327*	0.335*
	PCS	0.333*	0.342*	0.396*	0.377*	0.179*	0.147*
	MCS	0.472*	0.516*	0.503*	0.488*	0.318*	0.343*
HAD	Anxiety	–0.406*	–0.431*	–0.368*	–0.369*	–0.326*	–0.336*
	Depression	–0.471*	–0.505*	–0.535*	–0.510*	–0.290*	–0.280*
TSK	Total	–0.571*	–0.556*	–0.431*	–0.453*	–0.517*	–0.472*

*$p < 0.001$.
CPAQ-8: Chronic Pain Acceptance Questionnaire- 8 items; CPAQ-20: Chronic Pain Acceptance Questionnaire- 20-items; AE: Activity Engagement subscale of the CPAQ; PW: Pain Willingness subscale of the CPAQ; HAD: Hospital Anxiety and Depression scale; TSK: Tampa Scale for Kinesiophobia; SF-36: Short Form-36; PF: Physical Function; RP: Role Physical; BP: Bodily Pain; GH: General Health; VT: Vitality; SF: Social Function; RE: Role Emotional; MH: Mental Health; PCS: Physical Component Summary; MCS: Mental Component Summary.

Table VII. *Changes between pre- and post-rehabilitation measures (mean and 1 standard deviation (SD)) for CPAQ-8, CPAQ-20, SF-36, HAD and TSK (*n = *91)*

Measures	Version/subscales (min-max)	Pre-rehab scores Mean (SD)	Post-rehab scores Mean (SD)	*t*-value	df	*p*-value	ES[a]
CPAQ	CPAQ-8 Total (0–48)	18.8 (8.6)	23.3 (7.7)	–3.913	90	<0.001	0.55
	CPAQ-20 Total (0–120)	46.3 (17.4)	57.9 (15.8)	–4.755	90	<0.001	0.70
	CPAQ-8 AE (0–24)	8.9 (5.5)	11.5 (4.4)	–3.469	90	<0.001	0.52
	CPAQ-20 AE (0–66)	23.7 (12.9)	32.4 (10.4)	–5.032	90	<0.001	0.74
	CPAQ-8 PW (0–24)	9.9 (5.1)	11.9 (4.4)	–2.897	90	0.005	0.42
	CPAQ-20 PW (0–54)	22.6 (9.2)	25.5 (7.6)	–2.277	90	0.025	0.34
SF-36	PF (0–100)	50.0 (24.7)	58.9 (21.5)	–2.622	85	0.010	0.38
	RP (0–100)	14.1 (28.1)	21.5 (33.0)	–1.514	85	0.134	0.24
	BP (0–100)	24.8 (15.5)	31.9 (16.5)	–2.863	86	0.005	0.44
	GH (0–100)	35.9 (20.1)	44.5 (21.8)	–2.673	87	0.009	0.41
	VT (0–100)	25.1 (19.6)	28.7 (21.6)	–1.108	86	0.271	0.17
	SF (0–100)	47.3 (24.2)	52.0 (22.5)	–1.293	87	0.199	0.20
	RE (0–100)	32.7 (42.0)	43.9 (45.3)	–1.627	82	0.107	0.26
	MH (0–100)	49.7 (21.6)	59.2 (17.7)	–3.257	86	0.002	0.48
	PCS (0–100)	29.3 (8.2)	31.5 (9.1)	–1.590	80	0.116	0.25
	MCS (0–100)	32.4 (12.1)	36.6 (11.7)	–2.213	80	0.030	0.35
HAD	Anxiety (0–21)	9.9 (4.7)	8.3 (4.2)	2.293	87	0.024	0.36
	Depression (0–21)	9.4 (4.4)	7.3 (3.8)	3.328	87	<0.001	0.51
TSK	Total (17–68)	41.1 (10.1)	34.9 (8.1)	3.303	44	0.002	0.68

[a]ES: Cohen's *d* effect size. Values lower than 0.20 represents a small, up to 0.50 medium and over 0.80 large effect size.
df: degrees of freedom; CPAQ-8: Chronic Pain Acceptance Questionnaire-8 items; CPAQ-20: Chronic Pain Acceptance Questionnaire-20 items; AE: Activity Engagement subscale of the CPAQ; PW: Pain Willingness subscale of the CPAQ; HAD: Hospital Anxiety and Depression scale; TSK: Tampa Scale for Kinesiophobia; SF-36: Short Form-36; PF: Physical Function; RP: Role Physical; BP: Bodily Pain; GH: General Health; VT: Vitality; SF: Social Function; RE: Role Emotional; MH: Mental Health; PCS: Physical Component Summary; MCS: Mental Component Summary.

and to validate the measure for use in the Swedish language and in Swedish settings. The findings suggest that the CPAQ-8 has sound psychometric properties under these circumstances, including good internal consistency ($\alpha \geq 0.80$).

The analyses of the CPAQ-8 from a large clinical sample in Sweden support a 2-factor structure and the patterns of factor loadings in the CFA is consistent with results found in earlier studies conducted in other countries (17, 18). A satisfactory fit of the 20-item instrument was obtained by eliminating 2 items (14). The 8-item measure retains 2 subscales, AE and PW. In spite of some inconsistent data in looking at the subscales, it is only when they are combined that they can reflect the essential processes of pain acceptance in a theoretically consistent fashion.

Another purpose of the current study was to test whether the CPAQ-8 was able to reflect process and outcome changes following pain rehabilitation. The CPAQ-8 PW subscale showed larger effect size, while the total for the CPAQ-20 and the AE subscale showed a higher effect size than the CPAQ-8 scales (Table VII) and all were lower than the effect size of a previous study (39) measured by CPAQ-20 ($d = 1.6$). This difference may be consistent with the fact that the patients included in this study participated in an "acceptance-inspired rehabilitation", while the participants in the study by McCracken & Gutiérrez-Martínez (39) underwent an ACT-consistent interprofessional rehabilitation programme. Along with the changes is acceptance of pain process, the changes for outcome measures such as kinesiophobia and depression were of medium size. This, together with the pattern of correlations analysed showed that the CPAQ-8 can still track treatment changes and may be useful in the future as a way to examine treatment process, a key treatment development issue for ACT. The current data adds to a growing evidence-base for the role of change in psychological flexibility in the treatment for chronic pain, including the specific role of general psychological acceptance (39) and values-based action (40).

The socio-demographics of patients sample reflected a relatively diverse patient group (Table I). Although we did not test the generalizability of findings across homogeneous subgroups of patients within the larger sample, there is probably a good basis for assuming broad applicability within Sweden. It has been shown that demographic and background factors account for little variance across most measures of pain-related healthcare, disability and distress (7).

Correlation analyses including the CPAQ-8 were consistent with those of the CPAQ-20 and with earlier results from both versions (14, 17, 18). Given that acceptance is considered to be an adaptive behaviour it was found that it was negatively correlated with kinesiophobia. This is expected, since pain acceptance and kinesiophobia are the most strongly related to physical activity (41) or AE (or avoidance, in the case of kinesiophobia) and functioning when compared with the other measures used in this study. The SF-36's Bodily Pain subscale was positively correlated with CPAQ, indicating that higher pain acceptance is associated with less interference in activity due to pain, which is concordant with Fish et al.'s findings (17, 19).

Consistent with some previous studies, the AE subscale correlated more strongly than the PW one with measures of depression and QoL. This could be interpreted as a weakness

of the PW subscale (42); however, this interpretation does not fully take into account the full nature of acceptance. From the perspective of the contextual functional framework, PW measures the capacity to be present and in touch with the experience of pain without attempting to control it. Thus, acceptance is not just "engagement", it is a quality of engagement with openness and clarity of values. The process of acceptance is less theoretically coherent without these 2 parts and the other processes in ACT (39). Even so, PW was shown to be positively correlated with kindness and mindfulness and negatively with isolation or social function (Table V), suggesting that increasing willingness to experience pain may add unique benefits in the treatment of chronic pain (43, 44).

A short form of the CPAQ may have advantages, considering that this instrument is often included in a battery of other pain-related instruments, which taken together may burden patients as well as economic and environmental resources. It may also help researchers and those who conduct clinical audits to assess a wider variety of therapeutic processes. As researchers attempt to derive clinically meaningful scoring systems to better understand and classify patients in meaningful sub-groups, it is important to further study whether the shorter CPAQ can still identify the clusters that have been suggested in previous research (8, 43). This process may help clinicians to improve the design of rehabilitation programmes and predict treatment outcomes more accurately. Other potential development areas for the short form of the CPAQ are Internet or smartphone-based applications.

One limitation of this study was the use of parametric statistics on ordinal data. The reason was that most statistical tests under classic test theory rely on this type of statistics, e.g. Cronbach's alpha (31), and that it made it possible to replicate and compare the results with previous studies (e.g. factor structure and internal consistency reliability). One possible way to handle ordinal indicator variables in the future will be to evaluate the CPAQ using the Rasch method.

Another limitation in this study is that the analyses of the short version were performed based on the data of the full version delivered. Patients' responses to items may be subtly different depending on whether the 8 items are administered alone or embedded within 12 other items or other instruments. However, the consistency of the findings with previous research does provide some assurance. A third limitation of the study is the heavy reliance on self-report measures throughout. Some of the observed relations may have been considerably smaller had alternate methods of assessment been used. The reliance on statistical significance can also distract from a clear sense of the size of relations observed, which may be clinically unremarkable and therefore practically less useful (45).

The CPAQ-8 demonstrated sensitivity to changes in pain acceptance over time, resulting from treatments designed to increase acceptance. At this point it is important to acknowledge that pain acceptance and its measurement should be seen as a potentially useful method for understanding treatment processes, and possibly as a means for enhancing the benefits of a interprofessional rehabilitation. There is, however, a risk that the relatively more well known developments in measures of acceptance may lead researchers and clinicians to miss parallel and broader developments in the wider process of psychological flexibility. In fact, while acceptance may be the best-known part of psychological flexibility, it remains only one part, particularly focused on undermining patterns of avoidance. Other components, such as values-based action, cognitive defusion, flexible present-focused attention, and functional aspects, also deserve further development as ways to more broadly address goals, motivation, and cognitive processes (1).

In summary, this investigation, based in Sweden, supports the validity, reliability, generality and treatment sensitivity of the CPAQ-8. It is recommended for applications where the length of measures is the key overriding concern. The CPAQ-8 may be a valuable clinical tool in reflecting changes in pain acceptance during treatment, which, in turn, is likely to be a useful strategy for treatment development. Wider focus on the full model of psychological flexibility is also recommended.

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Authors' contributions. All authors participated significantly in completion of this project. Most of the health professions were represented among the authors, thus enriching this study from a range of fields of knowledge medical doctors, BG and BB; psychologist, LM; nurse, KÅ and physiotherapist, GR). The specific contributions were: BG and BB, responsible for the acquisition of data from SQRP. LM conceived the idea to examine the data for the purposes presented here and supervised the project in its totality. GSR and KÅ conducted the statistical analyses together and wrote different parts of the manuscript. All authors (GSR, KÅ, LM, BB and BG) actively participated in the process of editing the final version of the manuscript prior to submission.

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