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Bailey, R. W., Vowles, K. E., Witkiewitz, K., Sowden, G., & Ashworth, J. (2016). Examining Committed Action in Chronic Pain: Further Validation and Clinical Utility of the Committed Action Questionnaire. *Journal of Pain*, *17*(10), 1095-1104. https://doi.org/10.1016/j.jpain.2016.06.011

Published in:
Journal of Pain

Document Version:
Publisher's PDF, also known as Version of record

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Examining Committed Action in Chronic Pain: Further Validation and Clinical Utility of the Committed Action Questionnaire

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Disclosures**:** No conflicts of interest to report. This work was not supported by any funding sources.

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Abstract

Psychosocial treatments for chronic pain conditions, such as Acceptance and Commitment Therapy (ACT), have highlighted minimizing pain avoidance behaviors and increasing engagement in valued activities as key treatment targets. In terms of salient processes within ACT, committed action is considered essential to the pursuit of a meaningful life, as it entails a flexible persistence over time in living consistently with one's values. To date, however, only one study has examined the association between measures of committed action and important aspects of pain-related functioning. The purpose of the present study was to analyze the reliability of the Committed Action Questionnaire (CAQ) in a sample of 149 chronic pain patients, perform a confirmatory analysis of its factor structure, and examine how CAQ scores uniquely account for variance in functioning. Confirmatory factor analyses provided support for a two-factor model, and regression analyses, which examined the cross-sectional direct effects of the two subscales on health-related functioning, indicated that the CAQ accounted for significant variance in functioning after controlling for relevant covariates. Overall, these findings provide further support for the CAQ as a measure of adaptive functioning in those with longstanding pain.

Perspective: The article presents additional evidence for the reliability and validity of the Committed Action Questionnaire with chronic pain patients. Confirmatory factor analyses provided support for the two-factor model, with both subscales demonstrating significant associations with multiple facets of health- and pain-related functioning.

Keywords: chronic pain; committed action; values; behavioral therapy; Acceptance and Commitment Therapy

Introduction

The experience of pain is a complex phenomenon comprising multiple facets, including nociception, neurophysiology, learning history, and ongoing experience.[12, 29] Chronic pain is typically defined as pain lasting three months or longer [31] and encompasses a breadth of common and debilitating medical conditions. In contemporary medicine, chronic pain is typically treated from the biopsychosocial perspective which takes into account the breadth of factors that are believed to maintain pain over time.[13, 14] With regard to treatment strategies focusing on the behavioral factors involved, a primary objective frequently involves altering behavior to reduce the adverse impact of pain on role functioning. In particular, decades of research have suggested that persistent pain avoidance strategies are problematic, especially when they are frequent, inflexible, and ineffective.[22, 23, 36] Psychosocial interventions for chronic pain have thus traditionally emphasized the goal of decreasing pain avoidance.[12, 36]

Contemporary developments within the cognitive-behavioral tradition have further highlighted the benefits of targeting increased engagement in behaviors consistent with values. In particular, enhanced engagement in valued activities is a hallmark feature of Acceptance and Commitment Therapy (ACT).[16] Within ACT, values help bring into focus the longer-term outcomes considered part of a meaningful and fulfilling life. To date, data suggest that greater engagement in valued activities is associated with lower levels of disability and distress.[20, 27, 28, 39, 40] Furthermore, outcome research indicates that it is possible to increase engagement in valued activities over the course of treatment and that the increases are associated with improved functioning.[27, 38, 41]

A central process involved in values-based action is conceptualized in ACT as committed action.[16] Committed action is a present-oriented process that involves building up patterns of behavior that move an individual toward valued life directions. In other words, committed action takes place in the "here and now," and is part of an actively chosen path taken in the service of underlying values. [16] Specific to ACT-based approaches to pain treatment, this process entails, for instance, facilitating a present-focused ability to identify persistent and problematic pain avoidance strategies and shift those efforts toward pursuing values and living a meaningful life. Committed action further requires maintaining a careful balance between persistence and flexibility, with a willingness to experience discomfort, such as increased pain, or initial failure when pursuing goals related to what matters most to an individual, and, on the other hand, goals that are repeatedly unmet may be abandoned.[24, 25]

Although research indicates that ACT-based interventions for chronic pain generally lead to improved functioning,[2] at present, the only instrument designed to measure committed action is the Committed Action Questionnaire (CAQ), the reliability of which was initially examined with 216 chronic pain patients.[25] Results of the initial analyses indicated that the CAQ had good internal consistency and that committed action was significantly correlated with acceptance of chronic pain, another facet of the psychological flexibility model in ACT. Moreover, regression analyses demonstrated that the CAQ accounted for significant incremental variance over pain acceptance across multiple aspects of behavioral health.[25]

Although the results from the initial study of the CAQ are promising, the utility of the CAQ requires additional empirical study, particularly in relation to both the

generalizability of its reliability and validity and its incremental utility beyond instruments that measure similar behaviors. The present study therefore sought to examine the psychometric properties of the CAQ and evaluate the two-factor structure via confirmatory factor analysis. Further, given that values-based action and committed action share conceptual overlap under the psychological flexibility model in ACT, an additional purpose was to examine incremental utility of CAQ scores in explaining functioning among pain patients presenting for treatment. Specifically, it was hypothesized that CAQ scores would account for significant variance in pain-related emotional and physical functioning, even after controlling for values-based action.

Methods

Participant Characteristics

Participants were 170 adults presenting for an assessment appointment at a specialty pain treatment service in the United Kingdom between March of 2011 and October of 2012. In terms of schooling, participants had an average of 13.9 years of education (*SD* = 10.1). Descriptively, most had either completed only the compulsory course of education (38%) or had dropped out prior to graduating (32%). Most participants were White European (99%), female (62%), and married or cohabitating with a partner (67%), followed by those who were single (14%), divorced (12%), and widowed (7%). The mean age was 53.6 years (*SD* = 14.5).

The most commonly reported primary pain diagnoses were arthritis (27%) and fibromyalgia (24%), followed by herniated disk (9%) and degenerative disk disease (9%), sciatica or radiculopathy (8%), and spondylosis (5%). Half of participants did not report a pain diagnosis, although all patients provided data on pain location, with 95% and 72%

specifying a primary and secondary pain location, respectively. The most common primary pain location identified was lower back, lumbar spine, sacrum and/or coccyx (50%), followed by lower limbs (20%), full body (8%) and cervical region (8%). Participants frequently identified limbs or shoulders (47%) as a secondary pain site. Most participants were not working (66%), though 14% were working full time and 10% worked part time. Many were receiving some type of incapacity benefit or wage replacement (48%). The average pain duration was 11.6 years (*SD* = 11.6; median = 7.3), and ranged from 0.25 to 54.7 years.

Sampling Procedures

Data were collected from all participants at an assessment visit to initiate a course of treatment. The collection of these data was approved by the regional Research Ethics Committee of the U.K.'s National Health Service.

Sample Size and Power

In order to guide the data analyses and provide information on observed power, a post-hoc analysis of achieved power was computed based on a multiple regression model with seven predictors designed to detect a small (f^2=0.02), medium (f^2=0.15) or large effect size (f^2=0.35; Cohen, 1992) at an alpha of 0.05 and with a sample size of 149. Based on analyses using G*Power version 3.1.6,[9] achieved power was calculated at .403, .997, and .999 for a small, medium and large effect size, respectively, suggesting adequate power to detect medium and large, but not small, effects.

Measures

Study participants were assessed at a single point in time with a battery of self-report instruments. In addition to completion of this battery, they also provided

information pertaining to demographics (i.e., age, gender, years of education/educational achievement) and pain-related medical information (i.e., pain duration, pain intensity, pain-related medical visits, number of prescribed classes of analgesic medication).

Self-Report Instruments

British Columbia Major Depression Inventory (BCMDI). The BCMDI[18] is a 16-item instrument that assesses for the presence and severity of Major Depressive Disorder (MDD), according to the DSM-IV criteria.[1] Questions are anchored to a 5-point Likert-type rating scale that measures severity (1, *very mild problem*, to 5, *very severe problem*). Total scores (range 0-80) were calculated and higher scores reflect increased symptom severity. The BCMDI has demonstrated good psychometric properties and excellent sensitivity and specificity for MDD.[18] The internal consistency of the BCMDI in the present sample was acceptable (Cronbach's $\alpha = .89$).

Chronic Pain Values Inventory (CPVI). The CPVI[28] measures level of importance and success in six broad areas of valued activity, which comprise family, intimate or close interpersonal relationships, friends, work, health, and personal growth or learning. Importance and success in each valued domain are evaluated separately on a scale ranging from 0 (*not at all important/successful*) to 5 (*extremely important/successful*), which allows for the calculation of values importance, values success and discrepancies between levels of reported importance and success. The discrepancy subscale was used in the current study because of its relation to values-based action and thus its potential as a suitable covariate for the CAQ. This subscale was calculated by subtracting values importance from values success, such that lower numbers (in the negative direction) indicated higher levels of discrepancy. Prior research[28] demonstrated that the CPVI has acceptable internal

consistency (Cronbach's α = 0.89 for the six items of the discrepancy subscale in the present sample).

Committed Action Questionnaire (CAQ; Appendix). As noted, the primary aim of this study was to evaluate the CAQ and expand upon the initial study examining this measure.[25] The final version of the CAQ from the prior study included 18 items (reduced from the original set of 24), in which respondents were asked to report on the accuracy of each statement in relation to their current functioning, ranging from 0 (*never true*) to 6 (*always true*). An initial study of the CAQ supported its internal consistency and demonstrated that it was correlated with acceptance of chronic pain, another key component of psychological flexibility in ACT.[25] The prior study explored the factor structure of the CAQ using a principal components analysis, which revealed two underlying factors. The factor structure was interpreted based on the wording of the items, with the "positively worded" items subsumed by the first factor, and the "negatively worded" items falling under the second. Further, in this initial study, the CAQ explained a significant amount of variance in important areas of health-related functioning, above and beyond pain acceptance, which included depression, social functioning, and mental health. The internal consistency of the CAQ in the present sample was acceptable (Cronbach's α = .91).

Sickness Impact Profile (SIP). The SIP[4] includes 136 yes or no questions pertaining to health-related dysfunction. The three dimension scores of the SIP were used in the present analyses, which comprise physical, psychosocial, and independence-related disability. All scores range from 0 to 1, and higher scores indicate greater health-related dysfunction. Prior research has demonstrated the reliability and validity of the SIP in the

context of chronic pain.[37] The internal consistency of the SIP in the present sample was acceptable (Cronbach's α = .95).

Pain Anxiety Symptoms Scale-20 (PASS). The PASS[26] is a 20-item instrument that evaluates fear, anxiety and avoidance behaviors in the context of pain. This measure is anchored to a frequency scale ranging from 0 (*never*) to 5 (*always*). The PASS has demonstrated good reliability, validity, and utility in prior studies involving chronic pain populations.[32] The internal consistency of the PASS in the present sample was acceptable (Cronbach's α = .94).

Analytic Approach

Data screen and item analyses. All CAQ item responses were examined for missing data, and participants who did not record a single response for this measure (n = 21) were eliminated, resulting in a final sample size of 149. Bivariate correlations were then examined for evidence of collinearity as well as for ensuring convergent validity among the scale items. Item pairs were considered for deletion if bivariate correlations exceeded r = .85, indicating collinearity.[21] Next, item-total correlations were assessed, where any item with a correlation with the remaining scale items below r = .20 was considered for deletion.[10] Finally, internal consistency and the distribution of responses by item to evaluate normality were examined.

Factor structure and regression analyses. Following data screening, structural equation modeling (SEM) techniques were used to examine the two-factor structure of the CAQ. Although the prior study by McCracken [25] explained the two factors as emanating from wording effects, this conclusion was not tested empirically and research indicates that wording effects may or may not contribute to the emergence of separate factors.[11, 33] For

the present study, it was assumed that the two-factor solution indicated the presence of latent variables underlying the CAQ. Based on the item content, the subscales were labeled *values persistence* (VP), defined as the capacity to persist in the pursuit of goals, particularly when obstacles arise, and *non-reactive behavior* (NB), which is characterized by avoiding behaviors inconsistent with pursuing what matters most to the individual (e.g. not abandoning goals prematurely). (Note: The indicators that comprise the second factor of the CAQ, *non-reactive behavior*, were "negatively worded" and reverse scored prior to the analysis. Thus, higher scores were considered as indicative of better functioning.)

A confirmatory factor analysis (CFA) tested whether the items loaded onto the factors in a way that is consistent with the underlying theory of committed action in ACT. SEM was also implemented to test the associations between the two latent subscale variables and critical measures of functioning to explore the potential clinical utility in assessing committed action with chronic pain patients using the CAQ. The purpose of the SEM techniques was to examine the meaningfulness of committed action through its relationship with salient variables in chronic pain treatment.

The first step at this stage of the analyses involved specifying a measurement model where the individual items (indicators) of the CAQ were loaded onto their respective factors, as reported by McCracken [25] The CFA evaluated the degree of concordance between the variance-covariance matrix produced by the specified model (the population matrix) and the matrix derived from the present sample. This approach has several distinctions from exploratory factor analysis (EFA) techniques, such as principal components analysis, and was more appropriate for the present study. Methods of EFA are often used to discover the patterns in which items from a measure correlate with one

another in order to create subsets that are combined into factors and to delete the items that are least useful in explaining the latent variable of interest.[34] As the name implies, EFA is exploratory in nature and particularly useful in measure development when there is not a clear hypothesis about the underlying factor structure. In contrast, the goals of the present CFA included evaluating all of the items from the prior study and investigating the two-factor structure with the present sample. As a final analytic step, the utility of the CAQ factors in the statistical prediction of aspects of patient functioning was examined, including disability, depression, pain-related fear, and pain-related medical visits over the preceding three months. All analyses used the Mplus software package, version 7.3.[30]

The hypothesized CFA model (Figure 1) with two correlated latent factors scaled with unit loading identification was tested with maximum likelihood estimation. The latent factors were scaled by fixing the loading of the first item for each factor to 1, leaving a total of 136 freely estimated parameters, which resulted in an over-identified model with df_M = 308. The adequacy of the CFA model was first evaluated using the chi-square statistic, which compares the fit between the sample covariance matrix and the population covariance matrix. A non-statistically significant chi-square indicates good fit for a model overall [21]. Following the recommendations put forth by Jackson, Gillaspy, Purc-Stephenson [19] the hypothesized model was also evaluated against a residual-based measure, in this case the root mean square error of approximation (RMSEA), as well as incremental fit measures, which included the comparative fit index (CFI) and Tucker-Lewis index (TLI). Established benchmarks suggest that an RMSEA < .05 and < .08[5] and CFI and TLI > .95 and > .90, characterize models with good fit and acceptable fit, respectively.[17] The RMSEA hypothesis of close fit was also evaluated (H_0: RMSEA ≤ 0.05).

Missing data on the CAQ were present for 4.6% of all possible responses. In order to address these missing data, multiple imputation (MI) methods were used. The use of MI, as well as full information maximum likelihood (FIML), has demonstrated superiority to single imputation methods, such as mean substitution or regression-based imputation, and is especially useful when data are assumed to be not missing completely at random. Under this assumption, MI and FIML will tend to produce more unbiased estimates than complete case analysis or single imputation methods.[3] In the present study, MI was chosen over FIML because covariates were included in the analyses, and Mplus[30] defaults to listwise deletion for individuals with data missing on covariates. Using MI involves only two steps in Mplus: 1) creating 20 datasets that included all variables in the present analyses with multiple imputed values for each missing data point and 2) deriving a pooled estimate from each database for calculating beta estimates, standard errors, and indices of fit. In summary, although it is impossible to empirically evaluate the degree to which the would-be values of missing data might be related to the variables of interest,[3, 15] MI was conducted under the reasonable assumption that missing data in the sample for the present study may be related to measured variables in the analyses (e.g. pain intensity).

Following the CFA, the regression component of the present analyses was implemented to examine whether the two latent variables of VP and NB that comprise the CAQ were significantly associated with measures of health-related functioning, even after accounting for relations with other relevant variables. To accomplish this objective, a series of simultaneous linear regression equations were created, where each of seven aspects of health-related functioning, including physical, psychosocial, and independence-related disability, as well as depression, pain anxiety, pain-related medical visits, and the

number of prescribed analgesic medications were regressed on specific background variables, the values discrepancy measure (CPVI) and the two factors of the CAQ.

The regression analyses were completed in two steps, resulting in two sets of seven simultaneous regressions. In the first set, the background variables in the regression analyses included sex, pain intensity, pain duration, and years of education, and were entered as covariates because of their hypothesized relationship with pain-related functioning. The second set of regressions included these same background variables and added the values discrepancy scores of the CPVI, which was chosen as a covariate because of the theoretical similarity to committed action. Indeed, given that both committed action and values discrepancy (calculated as the difference between values importance and values success) are subsumed by the broader concept of values-based action,[16] this analytic approach appeared to be a particularly conservative method of testing the unique variance accounted for by the CAQ. Further, as part of the more general goals of a measure development study, the present analyses were intended to test whether the CAQ demonstrated incremental validity in predicting salient measures of functioning above and beyond currently available instruments. It should also be noted that the psychological flexibility model of ACT offered another relevant covariate in the Chronic Pain Acceptance Questionnaire (CPAQ), a 20-item instrument that measures activity engagement and pain willingness in chronic pain. The CPAQ, however, has been tested previously as a covariate by McCracken,[25] who found that CAQ and CPAQ scores were highly correlated and yet the CAQ still accounted for significant incremental variance explained in five of the six measures of functioning tested.

The results of the regression analyses included standardized regression

coefficients, or *betas*, which indicate the association between the predictor variables and the outcome of interest in terms of standard deviation units. Betas were standardized using the variances of the continuous latent variables as well as the variances of the outcome and covariate variables. These analyses also involved the imputed datasets using MI, where the single regression coefficients reported in the final results (Table 2) were pooled across the 20 datasets.

Results

Data Screening and Item Analysis

As noted, the final sample size for the following analyses consisted of 149 individuals. The 18-item CAQ demonstrated good internal consistency (Cronbach's α = .90) and corrected item-total correlations were all in the acceptable range (range r = .40 to .75), with the exception of item 11 (r = .18), *I get stuck doing the same thing over and over even if I am not successful*. In accordance with the guideline to consider deleting any item with an item-total correlation below r = .20[10], item 11 was dropped from all subsequent analyses, resulting in a 17-item scale. The final 17-item scale performed similarly in terms of reliability (Cronbach's α = .91). Item-total statistics also indicated that the removal of any one item did not substantially impact Cronbach's alpha, which ranged from α = .90 to .91. The skewness and kurtosis indices did not show any significant deviations from normality at the item level. The results of the data screening also indicated an absence of collinearity, with all inter-item correlations falling below the recommended cutoff of r = .85.

Factor Structure and Regression Analyses

The overall results from the hypothesized CFA model (Figure 1) demonstrated reasonable fit for the hypothesized two-factor model, with factors labeled as *values*

persistence (VP) and *non-reactive behavior* (NB). The incremental fit indices, CFI = .903 and TLI = .875, and the RMSEA = .061 (90% CI [0.050, 0.072]) all indicated reasonable fit. Although the upper bound of the RMSEA confidence interval was less than .10, supporting a decision to reject the poor-fit hypothesis, the lower bound did span .05, which results in a rejection of the close-fit hypothesis (i.e., that fit was "worse than close", *p*-value |RMSEA ≤ 0.05| = .04).[21] The chi-square statistic was also significant, χ^2_M (308) = 480.09, $p < 0.0001$, an indicator of poor fit. Finally, the collinearity diagnostics did not reveal any problematic associations among the items, including the latent variables, given that all correlations were in the moderate range, there were no beta weights outside the range of -1.0 to 1.0, and the tolerances ranged from .24 to .88. An examination of the residuals [last step![]

Although there were several indications of reasonable model fit, the modification indices suggested that one pair of items had shared variance not explained by the latent factor, and specifying the presence of this shared error variance in model specification would improve fit. This included items 15 (*I am able to pursue my goals both when this feels easy and when it feels difficult*) and 16 (*I am able to persist in what I am doing or to change what I am doing depending on what helps me reach my goals*). After examining the bivariate correlations, this result was unsurprising because items 15 and 16 had the highest degree of association among any of the item pairs (r = .82). Given that this pair of items appeared to capture similar behaviors within a single latent factor, several additional analyses were conducted. Initially, two CFA models, the first excluding item 15 and the second item 16, were conducted to determine if fit improved. The resulting fit indices were highly concordant with the CFA including all items, thus we proceeded to investigate a model where the error terms of these two items were allowed to correlate.

The re-specified model, which included the correlated error term, was tested with maximum likelihood estimation. The latent factors were scaled by setting the latent variable variances to 1.0, leaving 137 parameters freely estimated, which resulted in an over-identified model with df_M = 307. The results of the incremental fit indices, CFI = .920 and TLI = .896, were similar to the initial model and indicated reasonable fit. The RMSEA = .056 (90% CI [0.044, 0.067]) demonstrated an improvement over the baseline model, with the results indicating a rejection of the poor-fit hypothesis (upper bound < .10) as well as a failure to reject the close-fit hypothesis (p-value |RMSEA ≤ 0.05| = .019).[5] Furthermore, 10 of the 17 indicators in this model had more than 50% of their variance accounted for by their respective latent factor, which corresponds to a standardized factor loading ≥ .707, bolded in Table 1 (range R^2 .19 to .76, all p's < .001). The chi-square statistic, however, remained significant, $\chi^2_M(307) = 449.93$, $p < 0.001$, which was the sole indicator of poor fit in both models. Given that the other fit indices indicated at least adequate fit, it was decided that fit appeared reasonable. Internal consistency calculations provided further evidence of acceptable internal consistency, with Cronbach's alpha for VP = .93 and for NB = .85. The chi-square difference test suggested that the re-specified model represented a significant improvement over the first, $\Delta\chi^2(1) = 30.16$, $p < .0001$.

The regression analyses (Table 2) were constructed to examine the associations between the two latent factors that make up the CAQ subscales, VP and NB, and measures of health-related functioning, while also controlling for specific background variables. Analyses were conducted without the values discrepancy (CPVI) measure (SEM Model 1) and with the values discrepancy (CPVI) measure (SEM Model 2), in order to determine the unique predictive ability of the CAQ subscales above and beyond an existing measure of

values-based action.

In SEM Model 1 (without the CPVI), both factors of the CAQ were significantly associated with psychosocial, physical, and independence-related disability, as well as with depression and pain distress (range β -.52 to -19, all *p*'s < .05). In addition, the NB factor had a significant direct effect on pain anxiety (β = -.48, *p* < .001) and VP had a significant effect on the number of pain-related medical visits (β = -.27, *p* = .011). The background variables were weakly associated with the measures of functioning. In particular, pain intensity was significantly associated with pain distress (β = .49, *p* < .001) and pain anxiety (β = .18, *p* = .024), and pain duration was significantly associated with physical disability (β = .35, *p* < .001) and independence disability (β = .28, *p* < .001). The results did not reveal any other significant associations between background variables and pain-related functioning (range β -.15 to .12, all *p*'s n.s.).

In SEM Model 2 (with the CPVI included), the pattern of results with regard to the background variables was largely unchanged (see Table 2). Of primary interest were the results pertaining to the associations between the two CAQ factors and health-related functioning, after accounting for a theoretically similar measure in values discrepancy (the CPVI). Results indicated significant associations between all measures of health-related functioning and at least one factor of the CAQ. The NB factor, in particular, was significantly associated with the psychosocial (β = -.41, *p* < .001), physical (β = -.21, *p* = .038), and independence-related (β = -.27, *p* = .004) subscales of the SIP, and was also significantly associated with depression (β = -.53, *p* < .001), pain anxiety (β = -.47, *p* < .001), and pain distress (β = -.21, *p* = .017). These findings were all in the expected direction, such that greater NB scores were associated with decreased scores on the dependent measures.

In addition, the VP factor was also significantly associated with pain distress (β = -.22, *p* = .011) and number of pain-related medical visits (β = -.23, *p* = .039). Taken together, the results support the relevance of CAQ factor scores for multiple facets of patient functioning.

Also in SEM Model 2, the CPVI was significantly associated with physical, psychological, and independence-related disability, as well as with depression and pain anxiety (range β -.43 to -.21, all *p*'s < .01). The CPVI was not significantly associated with the number of analgesic medications variable or the number of pain-related medical visits. The overall results for this aspect of the analyses demonstrated that the associations between the background variables and important measures of patient functioning remained weak, and that the CPVI had robust negative associations, such that smaller discrepancies between values success and importance were associated with less disability, depression, and pain anxiety.

Discussion

The present study used a CFA to examine the two-factor structure of the CAQ that was demonstrated in a prior principal components analysis (McCracken, 2013). In addition to confirming the reliability of the items and factors that comprise the CAQ, the present analyses examined the degree to which the two latent factors of the CAQ were associated with measures of functioning relevant to chronic pain patients, including depression and pain-related anxiety. Finally, a goal of the present study was to replicate the findings of the original investigation of the CAQ in a new sample of individuals with chronic pain.

Consistent with the prior study,[25] the item-level analyses indicated that the CAQ performed well in the present sample of chronic pain patients. In particular, the results supported the internal consistency of the CAQ by demonstrating that the scale items were

sufficiently intercorrelated, without violating established guidelines regarding collinearity. Evidence of internal consistency suggests that the scale items point toward a common underlying construct [8], and the analyses produced a pattern of results similar to those of McCracken,[25] which further supports the reliability of the CAQ. Indeed, demonstrating reliability in multiple samples is an important component of measure development, as reliability is dependent on each administration of a measure. Specific to clinical practice, the reliability of an instrument under consideration should be evaluated in multiple settings and with different samples of research participants drawn from a clinical population. The results of the present study appear to support a preliminary position that the CAQ tends to produce reliable scores among pain patients in different chronic pain management settings.

In terms of factor structure, the present analyses also provided further evidence that the CAQ captures two processes related to committed action, values persistence (VP) and non-reactive behavior (NB). The former involves working toward important goals, both with and without the presence of challenges and setbacks, and the latter involves a tendency to avoid actions that are inconsistent with the spirit of committed action. Those who tend more toward VP and NB appear may be less likely, for example, to let impulsivity coordinate their actions. Together, VP and NB constitute facets of the psychological flexibility model proposed by ACT, whereby VP involves pursuing valued activities both when it is easy and when challenges are encountered. Further, psychological flexibility involves abandoning unworkable goals rather than rigidly adhering to them and determining alternative actions consistent with the identified value.[24] The flexibility inherent in committed action may be an especially critical quality among chronic pain

patients, who often attempt to achieve meaningful behavioral targets in the service of improving in important areas of functioning while accepting that pain may not ever go away, i.e. pursuing values with or without pain. The results of the CFA provided preliminary evidence in support of the theory that the CAQ assesses the two aspects of committed action, which concerns the construct validity of the CAQ in that the items are delineated topographically in a manner consistent with ACT principles. Although the chi-square statistic was fairly large and statistically significant, the incremental and residual-based fit indexes demonstrated adequate fit. Furthermore, the chi-square statistic derived from small samples may not actually follow the chi-square distribution, and thus the probability levels regarding overall model fit may not be accurate.[35]

Given the conceptual overlap between the item content in the CAQ, it was also important to examine the discriminant validity between the two factors. More specifically, the factors in a CFA should be only moderately correlated, which suggests that the latent variables examined involve different constructs.[21] With regard to the present analyses, the estimated factor correlation between VP and NB (r = .537) was indeed moderate in size and consistent with the hypothesis that the CAQ captures two separate latent variables. As expected, the association between the two subscales was positive.

The purpose of the regression analyses was to investigate incremental validity and determine whether the CAQ provided information relevant to assessment and treatment above and beyond a currently available instrument. In the first step of the regressions, without accounting for values discrepancy, the results confirmed that committed action may be a salient construct to measure when it comes to treating individuals with chronic pain, particularly in terms of both psychological distress and different facets of disability.

With regard to examining the incremental validity of the CAQ, it was important to demonstrate significant direct effects after accounting for theoretically similar measures related to the psychological flexibility model in ACT. In terms of the measures available for the current sample, a measure of values discrepancy (CPVI) appears to share properties with the CAQ, where both generally involve an assessment of success in pursuing valued activities. Thus, including the CPVI in the simultaneous regressions could demonstrate the utility of using the CAQ in addition to the CPVI as part of clinical assessment. After accounting for variance that was explained by the CPVI, the overall pattern of significance for the CAQ subscales did change, such that the VP subscale dropped from significance for depression and for the psychosocial, physical and independence-related disability, though VP remained significant for pain distress and the number of pain-related medical visits. None of the direct effects for the NB factor, however, dropped from significance, with NB still having significant effects in the expected direction on all measures of psychological functioning examined, including measures of depression, pain anxiety, and pain distress, and on the three facets of disability.

In terms of limitations, the sample size should be considered small for a CFA. According to Kline,[21] the ratio of cases to model parameters should be at least 10:1, or in absolute terms, at least $N = 200$. In the present study, the number of estimated parameters was 137 and, given the sample size of 149, the ratio is just over 1:1. Thus the current sample size is somewhat smaller than what is recommended, and future research on the CAQ should replicate the analyses in the present study in a larger sample. An additional limitation pertains to the cross sectional nature of the study design, which does not allow for interpretations of causal effects of the CAQ factors on the measures of pain-related

functioning. Future research efforts using this measure could employ longitudinal designs to explore whether committed action predicts change over time. This could be accomplished, for instance, through the use of latent growth modeling, which can help advance the science of ACT processes by showing that committed action is a mechanism of change.

The present study is part of a development process for use of the CAQ in clinical settings. Future investigations of this instrument would benefit from a focus on chronic pain populations in other medical settings, such as those involved in outpatient treatment with interdisciplinary teams. Further research should also investigate the CAQ with non-pain populations as well, in accordance with the centrality of committed action to ACT in general. Also, with regard to the patterns of significance from the regressions, future studies of the CAQ could focus on exploring whether the NB subscale continues to outperform the VP subscale after accounting for values discrepancy. If future research demonstrates that the NB subscale consistently has more robust associations with important psychosocial outcomes in chronic pain management, its use may be justified as a standalone measure. Lastly, future studies of the CAQ in separate populations could consider expanding the analysis to potentially important covariates beyond the psychological flexibility model in ACT, such as self-efficacy and fear avoidance. Doing so would serve as an important step in testing the whether incremental validity of the CAQ extends to instruments outside the ACT framework.

Given that this is in part a measure development study, a consideration for further research involves assessing whether the factor structure of the CAQ is invariant, i.e. remains stable, across different subgroups within a sample. Examining the invariance of

the CAQ is an important step in determining that a measure is evaluating the same construct across groups and is a prerequisite for unambiguously interpreting between group differences on a measure.[6] With a small overall sample in the present study, however, the power is inadequate to divide the participants into multiple groups to confirm measurement invariance.

Regarding the two-factor solution and discriminant validity, a final measurement development step for the CAQ might involve further analyses to confirm that the factors represent two meaningful and separate dimensions. Again, using reverse-scored items (present on the NB subscale) within a measure may lead to the appearance of separate factors on the basis of wording effects.[11, 33] Although the factors in the present study demonstrated sufficient discriminant validity, future research should investigate the possibility of a method effect from the negatively worded items. Perhaps the most straightforward means of examining the potential influence of wording effects would be to change the valence of the items in the NB subscale from negative to positive, administer the measure to a new sample, and retest the factor structure with CFA.

In summary, it appears that measuring committed action using the CAQ may be useful in predicting important outcomes related to functioning among chronic pain patients. The results also provide evidence supporting the validity of the theory underlying committed action in ACT, namely that it involves the key components of persistence, flexibility, and non-reactive behavior in the pursuit of goals. Ultimately, instruments like the CAQ may help researchers and clinicians understand the behaviors that lead to functional improvements in patients, including, but not necessarily limited to, those with chronic pain diagnoses.

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List of Figures

Figure 1. *Initial CFA model representing the two-factor structure of the 17-item version of the CAQ*

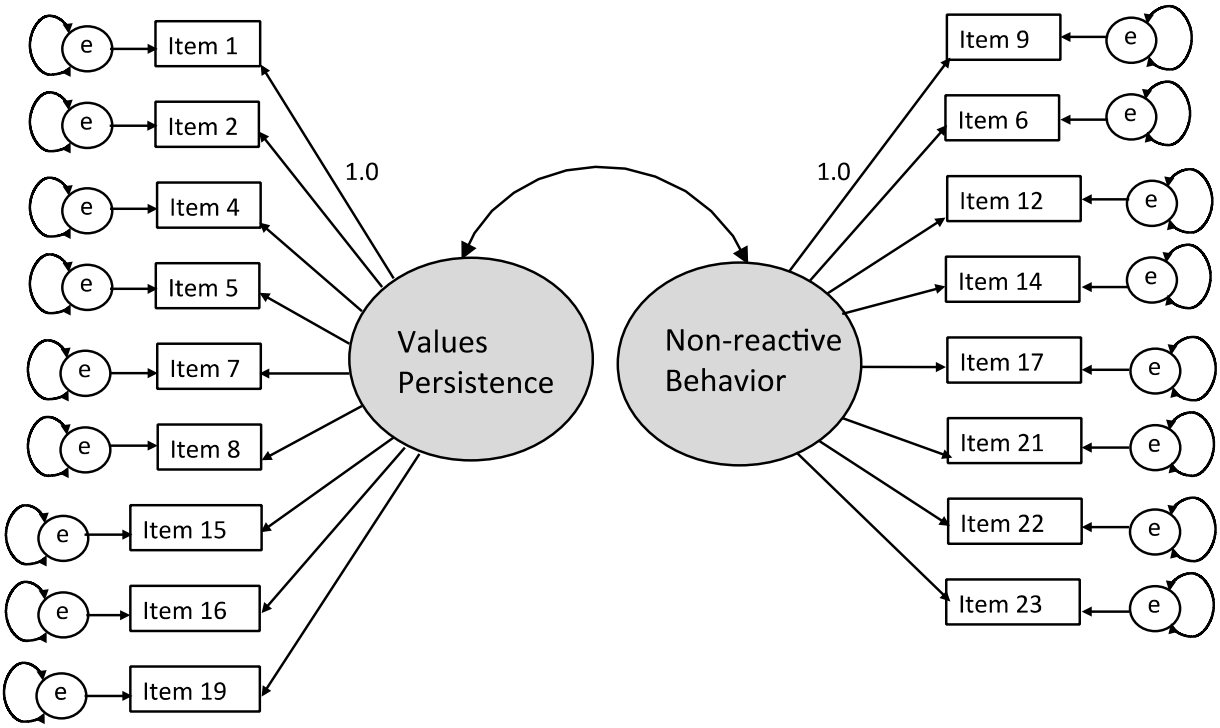
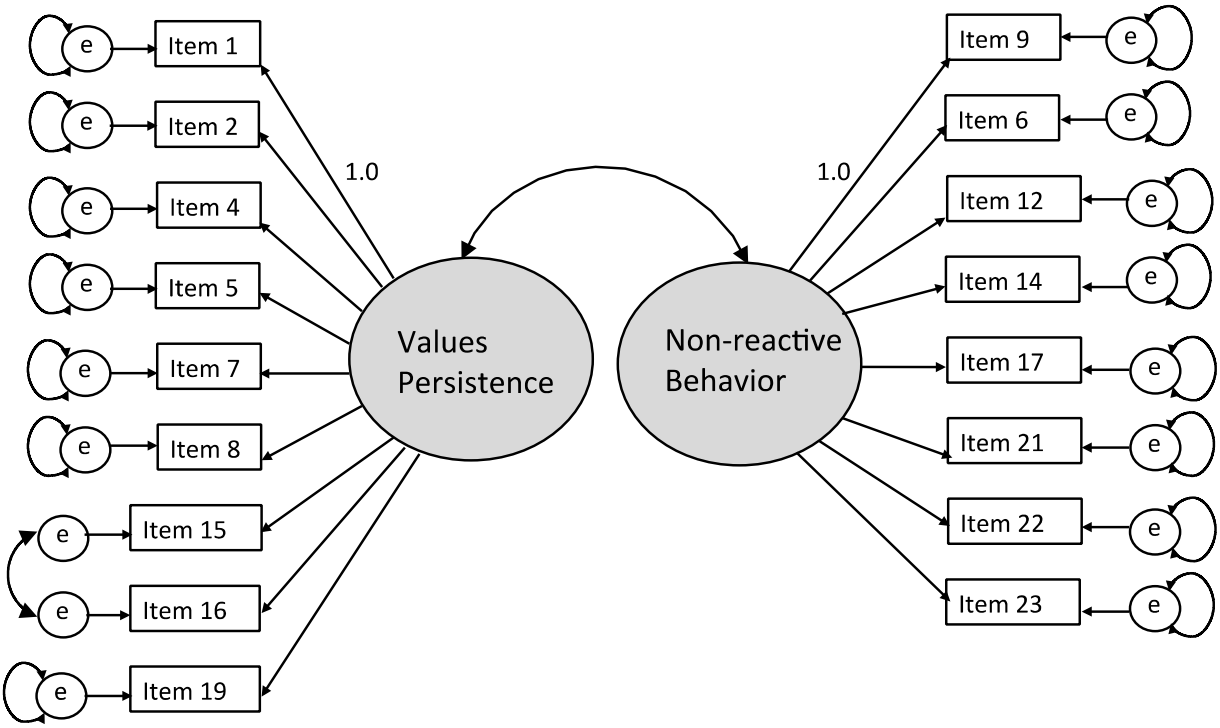


Figure 2. *Re-specified CFA model representing the two-factor structure of the 17-item version of the CAQ*



List of Tables

Table 1. *Standardized Factor Loadings for Scale Items*

Factor			
Values Persistence		Non-reactive Behavior	
Scale Item	Factor Loading	Scale Item	Factor Loading
Item 1	**0.71**	Item 6	0.60
Item 2	**0.76**	Item 9	0.66
Item 4	**0.78**	Item 12	0.59
Item 5	**0.79**	Item 14	0.44
Item 7	**0.76**	Item 17	0.70
Item 8	**0.87**	Item 21	**0.72**
Item 15	**0.74**	Item 22	**0.80**
Item 16	**0.80**	Item 23	0.62
Item 19	0.69		

Note. Standardized loadings that exceed .71, corresponding to a proportion of variance explained in the item by the factor > 50%, are bolded. All *p*'s < .001.

Table 2. *Simultaneous Multiple Regression Analyses Predicting Variance in Measures of Health Functioning Scores from Demographic and Self-Report Measures*

	SEM Model 1 - Without values discrepancy			SEM Model 2 - With values discrepancy		
Predictor	β	*S.E.*	*P*	β	*S.E.*	*P*
Psychosocial Disability						
Years of education	.01	.08	.883	<.01	.08	.979
Pain duration	.08	.08	.297	.11	.07	.122
Pain intensity	.04	.07	.617	.02	.07	.780
Sex	.09	.07	.229	.12	.07	.097
Values discrepancy	–	–	–	-.43	.08	<.001
Values Persistence	-.20	.09	.019	-.04	.09	.677
Non-reactive Behavior*	-.42	.09	<.001	-.41	.09	<.001
Physical Disability						
Years of education	.01	.08	.888	<.01	.08	.970
Pain duration	.35	.07	<.001	.39	.07	<.001
Pain intensity	.07	.08	.316	.06	.07	.410
Sex	-.11	.07	.145	-.09	.07	.216
Values discrepancy	–	–	–	-.39	.08	<.001
Values Persistence	-.19	.09	.029	-.04	.10	.701
Non-reactive Behavior*	-.23	.10	.022	-.21	.10	.038
Independence-related Disability						
Years of education	.02	.07	.753	.02	.07	.828
Pain duration	.28	.08	<.001	.32	.07	<.001
Pain intensity	.12	.07	.107	.11	.07	.140
Sex	.11	.07	.110	.14	.07	.046
Values discrepancy	–	–	–	-.36	.08	<.001
Values Persistence	-.24	.09	.004	-.10	.09	.270
Non-reactive Behavior*	-.28	.09	.002	-.27	.09	.004
Depression						
Years of education	.12	.11	.256	.12	.11	.260
Pain duration	.10	.07	.163	.13	.07	.060
Pain intensity	.04	.07	.527	.03	.07	.660
Sex	.02	.07	.733	.05	.07	.486
Values discrepancy	–	–	–	-.38	.07	<.001
Values Persistence	-.23	.08	.003	-.09	.08	.281
Non-reactive Behavior*	-.52	.08	<.001	-.53	.08	<.001

(table continues)

Table 2 (continued)

Pain Anxiety						
Years of education	.02	.08	.823	.01	.08	.852
Pain duration	.07	.08	.367	.09	.09	.287
Pain intensity	.18	.08	.024	.17	.08	.027
Sex	.09	.07	.201	.11	.07	.139
Values discrepancy	–	–	–	-.21	.08	.013
Values Persistence	-.12	.09	.183	-.04	.10	.694
Non-reactive Behavior*	-.48	.09	<.001	-.47	.09	<.001
Pain distress						
Years of education	-.03	.07	.648	-.04	.07	.633
Pain duration	.02	.07	.808	.02	.07	.738
Pain intensity	.49	.06	<.001	.50	.06	<.001
Sex	-.05	.07	.451	-.04	.07	.509
Values discrepancy	–	–	–	-.10	.08	.232
Values Persistence	-.26	.08	.001	-.22	.09	.011
Non-reactive Behavior*	-.22	.09	.013	-.21	.09	.017
Number of pain-related medical visits						
Years of education	-.14	.09	.148	-.14	.09	.136
Pain duration	-.15	.10	.120	-.14	.10	.147
Pain intensity	<-.01	.09	.985	<-.01	.09	.946
Sex	-.13	.08	.122	-.12	.08	.140
Values discrepancy	–	–	–	-.11	.10	.278
Values Persistence	-.27	.11	.011	-.23	.11	.039
Non-reactive Behavior*	.01	.12	.907	.02	.12	.856

Note. Betas were standardized using the variances of the continuous latent variables as well as the variances of the outcome and covariate variables.

*The items that comprise factor 2 were reverse scored prior to the data analyses

Appendix. *Committed Action Questionnaire Item Content**

Directions: Below you will find a list of statements. Please rate the truth of each statement as it applies to you by circling a number. Use the following rating scale to make your choices. For instance, if you believe a statement is "Always True", you would circle the 6 next to that statement.

0 **Never True**	**1** **Very Rarely True**	**2** **Seldom True**	**3** **Sometimes True**	**4** **Often True**	**5** **Almost Always True**	**6** **Always True**

1	I am able to persist with a course of action after experiencing difficulties	0	1	2	3	4	5	6
2	When I fail in reaching a goal, I can change how I approach it	0	1	2	3	4	5	6
4	I can remain committed to my goals even when there are times that I fail to reach them	0	1	2	3	4	5	6
5	When a goal is difficult to reach, I am able to take small steps to reach it	0	1	2	3	4	5	6
6	I act impulsively when I feel under pressure	0	1	2	3	4	5	6
7	I prefer to change how I approach a goal rather than quit	0	1	2	3	4	5	6
8	I am able to follow my long terms plans including times when progress is slow	0	1	2	3	4	5	6
9	When I fail to achieve what I want to do, I make a point to never do that again	0	1	2	3	4	5	6
11**	I get stuck doing the same thing over and over even if I am not successful	0	1	2	3	4	5	6
12	I find it difficult to carry on with an activity unless I experience that it is successful	0	1	2	3	4	5	6
14	I am more likely to be guided by what I feel than by my goals	0	1	2	3	4	5	6
15	I am able to pursue my goals both when this feels easy and when it feels difficult	0	1	2	3	4	5	6
16	I am able to persist in what I am doing or to change what I am doing depending on what helps me reach my goals	0	1	2	3	4	5	6

0 Never True	1 Very Rarely True	2 Seldom True	3 Sometimes True	4 Often True	5 Almost Always True	6 Always True

17	If I make a commitment and later fail to reach it, I then drop the commitment	0	1	2	3	4	5	6
19	I am able to incorporate discouraging experiences into the process of pursuing my long term plans	0	1	2	3	4	5	6
21	If I feel distressed or discouraged, I let my commitments slide	0	1	2	3	4	5	6
22	I get so wrapped up in what I am thinking or feeling that I cannot do the things that matter to me	0	1	2	3	4	5	6
23	If I cannot do something my way, I will not do it at all	0	1	2	3	4	5	6

Note:

*Item numbering is based on original 24-item measure from McCracken (2013)

** Item 11 dropped prior to the CFA analyses