Comparing the role of psychological flexibility and traditional pain mangement coping strategies in chronic pain treatment outcomes

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Shorter communication

Comparing the role of psychological flexibility and traditional pain management coping strategies in chronic pain treatment outcomes

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ABSTRACT

Psychologically-based interventions for chronic pain traditionally include a mix of methods, including physical conditioning, training in relaxation or attention control, strategies to decrease irrational or dysfunctional thinking patterns, and activity management training. Recent developments suggest additional methods to promote acceptance, mindfulness, values-based action, and cognitive defusion (a cognitive process entailing change in the influences exerted by thoughts without necessarily changing their form or frequency). Collectively, these processes entail what is referred to as *psychological flexibility*. This study examined how changes in traditionally conceived methods of coping compare to changes in psychological flexibility in relation to improvements in functioning over the course of an interdisciplinary treatment program. Participants were 114 chronic pain sufferers. Results indicated that changes in the traditionally conceived methods were essentially unrelated to treatment improvements, while changes in psychological flexibility were consistently and significantly related to these improvements. We suggest that psychological flexibility appears highly relevant to the study of chronic pain and to future treatment developments. The utility of more traditionally conceived pain management strategies, on the other hand, may require a reappraisal.

Psychological interventions appear effective at alleviating much of the suffering and disability associated with chronic pain. Recent meta-analyses have indicated that treatment achieves significant improvements across multiple domains of functioning, including depression, quality of life, and return to work (Chou & Huffman, 2007; Hoffman, Papas, Chatkoff, & Kerns, 2007). One focus of these interventions for chronic pain is on training patients in the use of "coping" strategies designed to reduce feelings of pain and the impact of pain in these domains (Morley, Eccleston, & Williams, 1999). Unfortunately, it has been difficult to reliably identify specific, adaptive, coping responses. For example, while methods such as increasing activities, engaging in exercise, using distraction, or practicing relaxation are presumed to be adaptive, a series of studies has shown they are only weakly or inconsistently related to functioning (Ektor-Andersen, Orbaek, & Isacsson, 2002; Jensen, Turner, & Romano, 2007; Turner, Holzman, & Mancl, 2007). These findings illustrate a significant issue – in essence, if the processes assumed to determine the effectiveness of treatment have not held up under empirical scrutiny, alternate processes must be considered.

To date, one attempt at an expanded model suggests a focus on psychological flexibility rather than coping as it has been traditionally conceived (McCracken & Vowles, 2007). The concept of psychological flexibility underpins recent empirically derived approaches to psychological intervention (e.g., Acceptance and Commitment Therapy, Hayes et al., 1999). Psychological flexibility is defined as one's ability to directly and openly contact experiences in the present moment and persisting or changing behavior according to what the situation affords and one's personal goals and values (Bond, Flaxman, & Bunce, 2008; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). This way of behaving in relation to pain can be contrasted to directing one's efforts toward the suppression of unwanted thoughts, avoidance of uncomfortable feelings or sensations, distraction away from current experience, or attempts to alter pain intensity, particularly when these responses interfere with goal attainment and values pursuit over the longer term.

Previous work examining this approach has shown, for example, that acceptance of pain as measured by the Chronic Pain Acceptance Questionnaire (CPAQ; McCracken, Vowles, & Eccleston, 2004) accounted for two to three times the variance in patient outcomes as that accounted for by a widely used measure of pain coping, the

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Coping Strategies Questionnaire (CSQ; Rosenstiel & Keefe, 1983) across nine measures of emotional and physical functioning (McCracken & Eccleston, 2003, 2006).

A measure that includes both the traditional and "expanded" approach to coping is the Brief Pain Coping Inventory-2 (BPCI-2; McCracken & Vowles, 2007). The BPCI-2 yields two coping subscale scores derived from factor analysis: Traditional Pain Management Strategies, including activity pacing, relaxation, methods for promoting positive thinking or self-efficacy, and physical exercise; and Psychological Flexibility, including realizing that pain does not prevent activity, engaging with pain in a nonavoidant or willing fashion, choosing not to struggle with pain or thoughts about pain, noticing pain without responding to it, and choosing to do what is valued, unrestricted by painful experiences. Previous results have demonstrated that, in comparison to the Pain Management Strategies subscale, the Psychological Flexibility scale more strongly and more reliably related to each of nine measures of emotional and physical functioning, including pain intensity, pain-related distress and anxiety, depression, physical and psychosocial disability, analgesic medication intake, daily uptime, and work status. It was concluded that some of the behaviors directly targeted for change by psychosocial interventions for chronic pain may not yield improvements in functioning as previously assumed (McCracken & Vowles, 2007).

It is not clear whether previous results regarding psychological flexibility will hold in longitudinal analyses, specifically conducted during the course of treatment. The purpose of this study was to examine how changes in the two subscales of the BPCI-2 from pre- to post-treatment relate to changes in functioning from pre-treatment through a three-month follow-up assessment. We specifically chose to focus our analyses on changes in the BPCI-2 from pre- to post-treatment as we felt that this approach would aid in isolating how changes in reported frequency of coping behaviors during the "active" phase of treatment related to functioning over the longer term. The results presented are from a planned secondary analysis of data presented in a previous treatment process and outcome study (Vowles & McCracken, 2008). These data do not overlap with those presented in the previous study of the BPCI-2 (McCracken & Vowles, 2007). We predicted that changes in psychological flexibility would demonstrate stronger relations than the traditional pain management strategies with primary gains in patient functioning.

Methods

Participants

Participants were 114 individuals (64.2% female) who completed a three- or four-week course of interdisciplinary treatment for chronic pain between January 2005 and July 2006, as well as a three-month follow-up assessment. There were an additional 16 individuals who discontinued treatment early and another 57 individuals who completed treatment, but not follow-up. Therefore, the present sample comprises 61.0% of the individuals who began treatment and 66.7% of those who completed it. The mean age of participants was 46.1 (SD = 10.0). The majority were White European (99.2%), married or cohabitating (71.2%, 15.3% single, 11.9% divorced, 1.7% widowed), unemployed (72.6%; Mean time unemployed: 43.9 months; SD = 62.0), and receiving some type of compensation or income support (73.3%). Median pain duration was 96.0 months (range: 8.0–360.0). The most frequently identified primary pain site was low back (44.4%, upper extremity 20.5%, full body 16.2%, lower extremity 11.1%, neck 2.6%, other 5.1%). Just over half reported a secondary pain site (55.1%).

Measures

All participants completed an assessment battery before and after treatment and at a three-month follow-up. Time was allocated during treatment to complete measures. A research assistant supervised these sessions to ensure complete data. Missing data occurred in fewer than 5.8% of cases on any single measure.

Brief Pain Coping Inventory – 2 (BPCI-2)

The BPCI-2 (McCracken & Vowles, 2007) was used as an index of self-reported frequency of coping responses to pain. The Pain Management and Psychological Flexibility subscales were derived from factor analysis and have each demonstrated acceptable internal consistency (Chronbach's $\alpha = .73$ for each; McCracken & Vowles, 2007). Items are listed in Table 1.

Measures of treatment outcome

Outcomes included eight measures of functioning, six of which were self-report. Average pain intensity over the past week was assessed using a 0 (no pain) to 10 (worst possible pain) numerical rating scale. Depression was assessed using the British Columbia Major Depression Inventory (Iverson & Remick, 2004). Pain-related anxiety and avoidance were assessed using the Pain Anxiety Symptoms Scale – 20 (McCracken & Dhingra, 2002). Physical and psychosocial disability were assessed with the Sickness Impact Profile (Bergner, Bobbitt, Carter, & Gilson, 1981). Finally, pain-related medical visits over the past 6 months, including primary, secondary, tertiary, and emergency care, were summed based on patient estimates. Two additional measures assessed physical functioning, including walking distance achieved in two minutes and the number of sit to stand repetitions performed in one minute using a standard, armless chair. Each of the self-report measures used has adequate psychometric properties and the physical measures have adequate test-retest reliability and convergent validity with other established indices of functioning (Harding et al., 1994).

Treatment program

Detailed information on treatment philosophy and content can be found in McCracken (2005) and Hayes, Strosahl, and Wilson (1999). In brief, treatment was a form of Acceptance and

Table 1
Items of the BPCI-2.

Traditional pain management
Encouraged myself or changed my thinking about my situation or pain.
Used physical exercise or stretching.
Paced myself (set reasonable goals, used rest breaks, or used appropriate rate of activity).
Changed my activity to keep myself focused on something other than pain.
Rested for a short time (less than 30 min) and then resumed activity.
Tried to "think positive" before I took some action.
Used ice, heat, massage, or a TENS unit (electrical stimulator).
Used a relaxation strategy to reduce feelings of pain.
Psychological flexibility
Rested most of the day (*reverse scored*).
Avoided a painful activity (*reverse scored*).
Realized that pain did not need to keep me from engaging in activity.
Kept doing what I was doing without letting pain stop me.
Used pain as a reason *not* to do something (*reverse scored*).
Struggled to get control of the pain (*reverse scored*).
Just noticed the pain without doing anything else about it.
Chose not to struggle with thoughts or feelings related to pain.
Made a choice to do what I value rather than to do something about my pain.
Remained aware of my pain while staying aware of the larger situation at the same time.
Did what works best for my goals in life regardless of what I was thinking or feeling at the time.

Commitment Therapy specifically designed for use in chronic pain settings and within an interdisciplinary team consisting of clinical psychology, physical therapy, occupational therapy, nursing, and medicine. The majority of patients were treated on a 3-week course (77.5%), and the remainder on a four-week course, which was designed for individuals who presented with more severe disability or distress. While in treatment patients lived independently in apartments adjacent to the hospital. Patients attended treatment five days per week for 6.5 h per day. Treatment was delivered primarily in a group format, although individual meetings occurred about once weekly. Each treatment day included approximately 2.25 h of physical conditioning, 1 h of psychological methods, 30 min of mindfulness training, and 1 h of activity management, with the remainder of the time devoted to skills training and health/medical education. Treatment integrity was maintained by supervision, observation, and manualization, as well as 3 h of clinical team meetings per week and a once weekly hour-long clinical seminar.

Analyses

Initially, we assessed whether those who had completed treatment and the follow-up appointment differed from those who had dropped out early or not attended follow-up. Next, we assessed whether measures had changed significantly between the assessment points. For the BPCI-2, we analyzed change from pre-treatment to follow-up. For all other measures, we assessed change from pre-treatment to follow-up. Although the present study was not formally concerned with assessing the effectiveness of treatment, as this has been reported elsewhere for this sample (Vowles & McCracken, 2008), we deemed it necessary for these measures to have changed significantly in order for an analysis of coping processes over the course of treatment to take place and felt it important to report these findings in the present study. Finally, the primary analyses consisted of comparisons between changes in the subscales of the BPCI-2 from the start to completion of treatment and change in measures of outcome from the start of treatment to the follow-up assessment. These analyses proceeded as follows: (a) residualized change scores for all measures were calculated, (b) bivariate correlations were calculated and evaluated, and (c) linear regression analyses were performed to determine the unique contributions of changes in each BPCI-2 subscale to changes in the outcome measures, after controlling for relevant background variables (i.e., age, gender, education, pain duration). Given that we felt the coping methods represented by the Pain Management Strategies subscale were the more or less established approach, this subscale was entered as the second step, and the Psychological Flexibility subscale was entered in the third and final step.

Results

Across all measures, pre-treatment values did not differ between those who completed treatment and those who did not, for ANOVA's, all F's < 2.40, all p's $> .12$, for Chi-square analyses, all χ's < 2.4, all p's $> .49$. Further, there were no differences among measures at pre or post-treatment between those who attended follow-up and those who did not, for ANOVA's, all F's < 2.97, all p's $> .07$, for Chi-square, all χ's ≤ 2.4, all p's $\geq .49$.

With regard to the repeated measures ANOVA's, we used a Bonferroni-corrected alpha level given the number of tests, calculated as .05 ÷ number of tests or .05 ÷ 11 = .005. The results indicated that both subscales of the BPCI-2 significantly improved over the course of treatment and through follow-up, each F (1, 117) ≥ 42.5, $p < .001$. Significant improvements through follow-up were also indicated for all outcome measures, all F's (1, 117) ≥ 32.9, all p's $< .001$. Descriptive information for all variables is located in Table 2.

Table 2
Means (SDs) for the coping and outcome measures.

Measure		
Pain coping	Pre-treatment	Post-treatment[a]
Pain management	26.2 (10.7)	39.1 (8.2)
Psychological flexibility	36.9 (11.8)	57.3 (9.8)
Outcomes	**Pre-treatment**	**Follow-up[a]**
Pain	7.0 (1.8)	5.9 (2.1)
Depression	26.7 (13.7)	15.5 (13.4)
Pain-related anxiety	45.4 (19.8)	27.7 (19.8)
Physical disability	0.17 (0.11)	0.11 (0.11)
Psychosocial disability	0.27 (0.16)	0.17 (0.16)
Walking distance (m/2 min)	9.9 (4.0)	13.6 (5.0)
Sit to stand repetitions (freq./1 min)	11.2 (7.4)	21.0 (11.4)
Medical visits	5.4 (4.6)	3.2 (3.3)

$N = 118$.
[a] All pairwise comparisons with pre-treatment scores were significantly different at a Bonferroni controlled alpha of $p < .004$.

Correlations among pre- to post-treatment residualized changes in the BPCI-2 subscales and pre-treatment to follow-up residualized changes in outcome measures are displayed in Table 3. The two subscales were modestly, although significantly, correlated with one another, $r = 0.16$, $p < .05$. Changes in the Pain Management Strategies subscale during treatment were not related to changes in any measure of outcome through to follow-up. On the other hand, changes in the Psychological Flexibility subscale were significantly related to improvements at follow-up in seven of eight outcome variables, failing in relation to changes in depression only.

The results of the regression analyses were generally consistent with the observed correlation results (see Table 4). None of the demographic variables accounted for a significant amount of variance in change in any of the outcome measures, nor did changes on the Pain Management subscale. Changes in the Psychological Flexibility subscale accounted for a significant amount of change in six of eight outcome measures, only failing to account for significant variance in changes in pain intensity ($p = .06$) and depression ($p = .98$). Changes in the Pain Management subscale accounted for an average of 0.34% of changes in the outcome measures (range: <0.1–1.0%), while changes in the Psychological Flexibility subscale accounted for an average of 9.1% of the variance (range: <0.1–16%).[1]

Discussion

The present study examined treatment-related changes in responses to pain from two differing conceptualizations of coping in relation to changes in a functioning through three-month follow-up. In sum, results indicated that traditionally conceived coping

[1] We performed two additional series of correlation and linear regression analyses. The first used pre- to post-treatment residualized change scores across both BPCI-2 subscales and all outcome measures ($N = 171$) and the second used pre-treatment to 3 month follow-up residualized change scores for these same measures ($N = 114$). The overall findings were remarkably similar and, therefore, are not reported in detail within the present report. In brief, across both time periods, changes in the Pain Management subscale had a significant correlation with improvements in treatment outcome for only one of 15 correlations, while changes in the Psychological Flexibility subscale had 14 of 15 correlations significant. As would be expected, results of linear regression analyses were also largely similar with changes in the Pain Management subscale accounting for significant variance in only one of 15 equations and changes in Psychological Flexibility accounting for significant variance in 14 of 15. Detailed results of these analyses are available from the web link listed in the Appendix or from the authors upon request.

Table 3
Correlations between residualized changes in BPCI-2 subscales (pre- to post-treatment) and residualized changes in outcome measures (pre-treatment to follow-up).

Outcome measure	Pain management	Psychological flexibility
Pain	−.001	−.19*
Depression	−.09	−.04
Pain-related anxiety	−.03	−.37***
Physical disability	−.06	−.41***
Psychosocial disability	−.05	−.33***
Walking distance	.05	.29**
Sit to stand	.03	.37***
Medical visits	.05	−.27**

*$p < .05$, **$p < .01$, ***$p < .001$.

responses were generally unrelated to improvements in functioning, while responses that entail what is called "psychological flexibility" were reliably and significantly related to improvements in functioning. Here psychological flexibility includes processes of decreased struggling to control pain, improved participation in meaningful activities, and increased present-focused awareness (Hayes et al., 2006), also referred to as acceptance, values-based action, and mindfulness.

Our results are consistent with those from previous studies showing that increased acceptance correlates with treatment-related improvements in a study using essentially the same sample (Vowles & McCracken, 2008) and in earlier studies using the same treatment but an entirely independent sample (McCracken, Vowles, & Eccleston, 2005; Vowles et al., 2007). These results are also consistent with treatment process work supporting the role of psychological flexibility in other clinical applications (for a review, see Hayes et al., 2006).

Psychological interventions for chronic pain have established efficacy. While it has often been assumed that these interventions operate by increasing patients' use of the types of coping behaviors measured by the Pain Management Strategies subscale, changes in these behaviors during treatment were not related to treatment results in the present study. It is plausible that this is due to a failure in the BPCI-2 to accurately capture the appropriate facets of these methods of coping. It is also plausible that this result has occurred due to the specific processes and methods of the treatment approach used, an ACT-based therapy. Nonetheless, we observed that the frequency of Pain Management Strategy use increased significantly during treatment, and thus it is remarkable that it accounted for no significant variance in any of the eight equations where it was tested.

Table 4
Variance estimates and standardized coefficients from linear regression analyses.

Step	Measure	Δr^2	β
Δ Pain			
1	Δ Pain management	<.001	.02
2	Δ Psychological flexibility	.034	−.19
Δ Depression			
1	Δ Pain management	.007	−.08
2	Δ Psychological flexibility	<.001	.002
Δ Pain-related anxiety			
1	Δ Pain management	.004	.03
2	Δ Psychological flexibility	.13*	−.36*
Δ Physical disability			
1	Δ Pain management	.01	−.05
2	Δ Psychological flexibility	.16*	−.40*
Δ Psychosocial disability			
1	Δ Pain management	.001	−.01
2	Δ Psychological flexibility	.07*	−.27*
Δ Walking distance			
1	Δ Pain management	.001	.02
2	Δ Psychological flexibility	.09*	.30
Δ Sit to stand			
1	Δ Pain management	.001	.01
2	Δ Psychological flexibility	.13*	.37*
Δ Medical visits			
1	Δ Pain management	.002	.08
2	Δ Psychological flexibility	.11*	−.33*

Note: In each equation, age, gender, education, and pain duration were tested for entry and not found to account for significant variance.
*$p < .01$.

The failure of the traditional pain management strategies to correlate with treatment outcome may be clarified by taking a more functional and contextual view of coping behaviors. For example, "activity pacing" can serve many purposes, such as avoiding pain versus maintaining consistent functioning over time, and this difference can lead to entirely different results (McCracken & Samuel, 2007). Rather than increasing the frequency of behavior with the form of "pacing" or other traditional coping strategies, perhaps treatment programs need to focus on the nature of interactions between behavior and situations where it occurs, on the influences being exerted on behavior, and the purposes being served. This may better promote behavior that is positively directed toward the achievement of meaningful and successful daily activity rather than merely away from pain or other unwanted experiences.

It seems possible that psychological flexibility, as defined here, is an active process within some current approaches to chronic pain, even though it has not been defined as such. An increasingly diverse series of studies have highlighted that acceptance of chronic pain may be a key process involved in successful adaptation to chronic pain (e.g., Kratz, Davis, & Zautra, 2007; Mason, Mathias, & Skevington, 2008; McCracken et al., 2005; Vowles & McCracken, 2008; Vowles, McCracken, & Eccleston, 2007). There may be benefits to expanding this line of study in two ways. The first would be to include other aspects of psychological flexibility beyond acceptance. The second would be to bring the processes underlying psychological flexibility to the investigation of change in a wider range of psychological treatments for pain, including some with a more "traditional" approach, as we have called it here. Further, emerging treatment methods, such as ACT, but also including Dialectical Behavior Therapy (Linehan, 1994) and Mindfulness-Based Cognitive Therapy (Segal et al., 2002), among others, seem to be united in that they are more explicitly focused on the promotion of present-focused awareness (an aspect of mindfulness) in facilitating living that is more vital and fulfilling even while unwanted experiences continue. It seems fair to say that this explicit focus has not been as apparent historically in conceptualizations of coping, where the focus has been more on symptom reduction.

There are additional theoretical points to be made about the coping model presented here relative to those presented elsewhere. Our point is not to show that one model is more "true" than others. For instance, acceptance, when considered functionally, could be conceived of as a part of previous frameworks for at least the past 60 years (e.g., Rogers, 1946), and perhaps longer. We would

There is increasing empirical support for the treatment approach outlined here. At present, there are at least 16 published trials in chronic pain, and there are other studies in areas of diabetes, tinnitus, epilepsy, smoking, eating, and exercise, all providing support for acceptance and mindfulness-based treatments (see McCracken, Vowles, Gregg, & Almada, in press for a review). There is also a growing number of treatment studies in broader areas of depression, anxiety, substance abuse, and psychosis (see Hayes et al., 2006 for a review). Although this literature is relatively young and methodological challenges remain, we contend that there is sufficient evidence at present to conclude that these approaches are at least promising and worthy of additional inquiry.

argue that perhaps the most important contribution of recent developments within psychology, including but certainly not limited to ACT, is that they represent a shift in focus from previous work, as well as a blending of ideas, within the confines of a specific theoretical framework (see Hayes et al., 2006). Some of these shifts are more obvious, for example the specific inclusion of present-focused awareness in treatment, while others are more subtle, such as the use of exposure to facilitate flexible and responsive behavior, rather than symptom reduction, or the fact that values clarification and values-based action take a central role in treatment from its outset, rather than as a follow-on after problematic beliefs and assumptions have been altered (Vowles, Wetherell, & Sorrell, 2009; Vowles et al., 2007).

The present study has limitations. First, 61% of individuals who began treatment provided follow-up data and it is possible that a more complete set of data would yield different results. Our analyses naturally were restricted to the data that were available, including data at a 3 month follow-up. We believe the significance of this limitation is attenuated to some extent by the consistency in findings across different measures and the lack of differences among those who completed all assessments and those who did not. Second, as mentioned, it is possible that the pattern of observed findings was in some way a product of the treatment provided, which specifically targets the responses within the Psychological Flexibility subscale. Further study will be needed to explore whether this is a valid concern. Finally, the variance accounted for by changes in the Psychological Flexibility was somewhat modest and was not significant for depression. Continued work is needed to determine the importance of these findings.

In addition, the coping literature as a whole is limited. It may be that bias built in to the items of the BPCI-2 contributed to the observed outcomes. For example, others have shown how at least some items from coping scales can be confounded with distress and can therefore interfere with accurate measurement (Stanton et al., 1994, 2000). In addition, it seems pertinent to make note of the difficulty in effectively segregating psychological constructs into "process" or "outcome" measures. From a psychometric perspective, it would be desirable to have orthogonal measurement of these two concepts; however, that is not likely to occur in clinical settings with complex human beings. Future research in this area is needed. It is possible that identifying specific behavioral processes linked with specific adaptive outcomes is sufficient enough to overcome overlap in process and outcome measurement.

The core message of the present analyses, particularly when they are considered in light of the extant coping literature in this area (e.g., Ektor-Andersen et al., 2002; Jensen et al., 2007; McCracken & Vowles, 2007; Turner et al., 2007) is that the coping behaviors often targeted within treatments have not been shown to be related to outcomes in ways we assumed they would be. In short, there is a need to re-appraise some of the coping responses defined as adaptive within current psychological frameworks. It appears there may be additional processes or modes of coping that may be useful to integrate. Additional research will be needed to confirm this suggestion. The extant literature, including the present study, perhaps highlight one process above the others, namely acceptance of pain. The other processes underneath the broader process of psychological flexibility and the overall process itself will require further development and scrutiny.

Appendix. Supplementary data

Supplementary data associated with this article can be found in the online version, at doi:10.1016/j.brat.2009.09.011.

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