# Acceptance-Versus Change-Based Pain Management: The Role of Psychological Acceptance

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## Abstract

This study compared two theoretically opposed strategies for acute pain management: an acceptance-based and a change-based approach. These two strategies were compared in a within-subjects design using the cold pressor test as an acute pain induction method. Participants completed a baseline pain tolerance assessment followed by one of the two interventions and another pain tolerance test. The alternate strategy was presented in a separate, but otherwise identical, experimental session. On average, both interventions significantly increased pain tolerance relative to baseline, with no significant difference between the two intervention conditions. Baseline psychological acceptance emerged as a significant moderator of intervention efficacy; individuals with a high level of acceptance benefited significantly more from the acceptance intervention, whereas those with a low level of acceptance benefited more from the change-based intervention. Implications for increasing the effectiveness of psychotherapeutic treatments based on individual differences are discussed.

# Keywords

psychological acceptance, pain, distress tolerance, cold pressor test

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The past decade has witnessed exponential growth in interest in psychotherapeutic models that highlight mindful acceptance of distressing subjective experiences rather than efforts to change or otherwise eliminate such experiences (Herbert & Forman, 2011; Herbert, Forman, & England, 2009). However, considerable debate has emerged regarding whether these new approaches are in fact functionally distinct from more traditional, change-based models (Forman & Herbert, 2009; Hofmann & Asmundson, 2008; Longmore & Worrell, 2007).

This study compared two previously validated treatments for pain: acceptance-based and change-based psychological coping interventions. Change-based strategies arise from traditional models of cognitive-behavior therapy (CBT). These interventions (Phillips, 1987; Sternbach, 1987; Turk, Meichenbaum, & Genest, 1983) are based on the view that subjective experiences, and especially cognitions, are causally related to dysfunctional behavior. Consequently, change-based pain management strategies involve direct efforts to change the form, frequency, or situational sensitivity of maladaptive pain thoughts. Common examples of change-based strategies include cognitive restructuring, relaxation techniques, and distraction.

In contrast, acceptance-based strategies represent relatively novel CBT approaches that foster mindful acceptance of distressing experience in the service of valued behavior (Hayes, Strosahl, & Wilson, 1999; Zettle & Hayes, 1987). Psychologically, acceptance connotes an active process of taking in an experience without attempting to alter its form or frequency (Herbert et al., 2009). Acceptance-based approaches aim to teach patients to experience emotions and bodily sensations more fully and without avoidance, and to simply notice the presence of thoughts, images, memories, and so on without following, resisting, believing, or disbelieving them (Hayes, Strosahl, et al., 1999). Thus, these practices are similar to the construct of mindfulness, defined as nonjudgmental awareness of present-moment experience without cognitive elaboration (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008; Kabat-Zinn, 1982).

Standard CBT and acceptance-based approaches have been used as coping strategies in acute pain induction studies (Hayes, Bissett, et al., 1999; Keogh, Bond, Hanmer, & Tilston, 2005; McMullen et al., 2008) and in chronic pain populations (McCracken & Eccleston, 2006; Vowles, McCracken, & Eccleston, 2007). Comparative trials of these strategies have generally shown superiority of acceptance-based approaches for coping with acute and chronic pain. However, the specific content and duration of the interventions used in previous studies are widely disparate, which limit the conclusions about their relative effectiveness. In addition, previous studies

have not taken into account factors other than the type of strategy used during pain management. For example, the effectiveness of the interventions is known to vary widely across individuals, but previous studies have not considered individual difference measures that may provide detailed information about what type of strategy may benefit subgroups of individuals.

This study used the Philadelphia Mindfulness Scale (PHLMS; Cardaciotto et al., 2008) to investigate the role of psychological acceptance and mindful awareness (i.e., the two key constituents of mindfulness) in the use of these two types of pain management strategies. It was expected that individuals with higher levels of psychological acceptance in particular would respond more beneficially to the acceptance-based intervention because this strategy is more congruent with their natural coping style. Whereas, it was expected that individuals with lower levels of psychological acceptance would benefit more from the change-based intervention.

In sum, this study had two main objectives: (a) to compare an acceptancebased and a change-based pain management strategy for experimentally induced pain and (b) to investigate the role of psychological acceptance and mindful awareness as possible moderators of the efficacy of acceptance- and change-based pain management strategies.

# Method

#### Participants

A total of 32 healthy, right-handed undergraduates (20 women) with a mean age of 20.34 years (SD = 2.12 years) participated. All participants gave informed consent before participating and received compensation for their participation. A within-subjects design was used. Each participant took part in two experimental sessions, which were held an average of 9 days apart (SD = 5.1 days). Each participant was administered the acceptance-based intervention and the change-based intervention, one intervention in each of two sessions; the order of the interventions was counterbalanced across participants to control for potential sequence effects.

#### Measures

Cold pressor pain was delivered through the use of a circulating water bath system (Lauda RM6), which is designed to circulate water through a cooling mechanism and into a reservoir tank. The water temperature was held at a constant 3°C. Pain tolerance was operationalized as the amount of time

(in seconds) that participants were able to keep their hand submerged in the cold water. For safety reasons, participants were not allowed to exceed 300 s of exposure to the cold water (Mitchell, MacDonald, & Brodie, 2004).

The PHLMS (Cardaciotto et al., 2008) is a 20-item, self-report measure assessing the level of mindfulness as defined by its two key constituents: presentmoment awareness and nonjudgmental acceptance. Items are rated on a 5-point Likert-type scale (0 = never, 4 = very often) according to the frequency that the item was experienced within the past week. Exploratory and confirmatory factor analyses support a two-factor structure, corresponding to the two subscales (i.e., psychological acceptance and mindful awareness). Good internal consistency (i.e., Cronbach's alpha ranging from .75 to .82) was demonstrated in clinical and nonclinical samples (Cardaciotto et al., 2008). The awareness and acceptance subscales were found not to be correlated with each other, thus providing additional support for the bidimensional conceptualization of mindfulness. For the current sample, the awareness subscale revealed a Cronbach's alpha of .57, the acceptance subscales had a Cronbach's alpha of .54.

#### Interventions

Both interventions were 30 min in length and were presented in the same format and by the same experimenter for every participant. Each intervention included a rationale, metaphors to illustrate key concepts, an acronym designed to aid memory of those concepts, and a quiz to ensure that the participants understood how to use the strategy during the subsequent cold pressor test. The acceptance strategy focused on noticing and acceptance of distressing sensations and thoughts, and cognitive defusion or distancing from painful sensations. The change strategy focused on mental distraction, challenging negative thinking, and visual imagery.

# Procedure

After providing informed consent, participants first completed demographic questionnaires and the PHLMS. During the first testing session, participants completed a preintervention cold pressor test in which they submerged their nondominant hand into the water and were instructed to keep it submerged until they were compelled to remove it due to the pain. This baseline measure of pain tolerance was given before any intervention instructions. The experimenter used a stopwatch to measure pain tolerance latency (maximum of

5 min). After the first cold pressor test was completed, participants underwent one of the experimental interventions, either the acceptance or the change intervention. During the intervention, participants were informed that they would perform another cold pressor test while implementing the given pain management strategy. The postintervention cold pressor test was administered in exactly the same manner as the preintervention test. Participants' second testing session was identical to the first, except that the alternate intervention strategy was delivered. During the second testing session, participants once again completed a preintervention (i.e., baseline) cold pressor test. Participants were instructed to use whatever strategy they would normally use in the given situation during the second session baseline cold pressor test (i.e., they were instructed to use the same approach that they used in the first session baseline test). After the preintervention cold pressor test, participants were administered the intervention that they had not received during the first testing session, followed by a postintervention cold pressor test using the presented intervention strategy. At the end of each testing session, participants completed a treatment integrity questionnaire using a Visual Analog Scale ranging from 0 to 10, which asked them to rate how useful each strategy was (i.e., with 10 corresponding to very useful) and how much they applied the given strategy during the postintervention cold pressor test (i.e., with 10 corresponding to applied fully).

# Results

# **Preliminary Results**

First, we analyzed the data using a 2 (intervention) × 2 (order) ANOVA to ensure that the order of the intervention did not unduly influence the gain in pain tolerance from pre- to postintervention. Neither the main effect of intervention, F(1, 29) = 1.93, p = .18, nor the main effect of order, F(1, 29) = 0.39, p = .54, was significant. In addition, the Intervention × Order interaction was also not significant, F(1, 29) = 1.78, p = .19. Next, we tested for any significant differences between the first session baseline pain tolerance and the second session baseline to establish that the first testing session did not contaminate the data from the second testing session. A paired-samples *t* test revealed no significant difference between the first and second session baseline pain tolerance measures, t(30) = -1.747, p = .091,  $\eta^2 = .092$ . In addition, these baseline comparisons were not significantly different for those participants who received the acceptance intervention first, t(14) = -.806, p = .434,  $\eta^2 = .044$ ), nor for the participants who received the change-based intervention first,



**Figure 1.** Mean pain tolerance in seconds for each of the four separate administrations of the cold pressor test Note: Error bars represent SE of the mean.

t(15) = -1.554, p = .141,  $\eta^2 = .139$ ). On the basis of these small effect sizes, the second baseline cold pressor test was not significantly influenced by the first testing session, regardless of the order of the interventions. In addition, the lack of a difference between the two baseline cold pressor administrations suggests that participants indeed followed the experimenters' instructions during the second baseline and did indeed "use the same approach that they used in the first session baseline test."

# Comparing acceptance- and change-based pain management strategies

Behavioral pain tolerance data were then analyzed with a 2 × 2 repeatedmeasures ANOVA using intervention (acceptance vs. change) and time (pre- vs. postintervention cold pressor test) as factors. The ANOVA revealed a significant main effect of time, F(1, 30) = 23.2, p < .001, and  $\eta^2 = .44$ ), with withdrawal latency for the postintervention tests being significantly longer (M = 180.0 s, SD = 108.8 s) than for the preintervention tests (M = 129.8 s, SD = 110.3 s). In particular, the acceptance-based intervention yielded a mean pain tolerance increase (i.e., from pre- to postintervention) of 39.7 s (SD = 57.5 s), whereas the change-based intervention yielded a mean increase of 61.6 s (SD = 85.2 s; see Figure 1). However, the intervention by time interaction was not significant, F(1, 30) = 2.0, p = .17, and  $\eta^2 = .06$ ).

To investigate the role of psychological acceptance on baseline pain tolerance, we ran a correlation analysis and found that acceptance score, as measured by the PHLMS, was significantly positively correlated with baseline pain tolerance (i.e., from the first session; R = .451, p < .01). However, the awareness subscale score was not correlated with baseline tolerance (R = .064, p >.50). Therefore, individuals with higher levels of acceptance had a greater baseline pain tolerance, before any intervention delivery.

### **Moderation Analysis**

We conducted further analyses to examine the roles of acceptance and awareness, as measured by the respective PHLMS subscales, on pain tolerance performance in the two intervention conditions. A regression analysis revealed a significant interaction between psychological acceptance and intervention condition for differences in pain tolerance improvement ( $R^2$  =  $.35, p < .001, \beta = .60$ ). Pain tolerance improvement was defined as the difference between the postintervention pain tolerance latency and preintervention pain tolerance latency, for each intervention separately (i.e., postacceptance latency minus preacceptance latency and postchange latency minus prechange latency). The regression analysis revealed that participants with higher levels of psychological acceptance benefited most from the acceptance-based intervention, whereas those with lower levels of psychological acceptance benefited most from the change-based intervention (see Figure 2). Thus, the acceptance subscale of the PHLMS moderated the relationship between pre- and postintervention pain tolerance improvements for the two intervention strategies. PHLMS awareness was not a significant predictor of differences in pain tolerance gain for the two conditions ( $R^2 = .004$ , p = .72,  $\beta = -.07$ ).

# Treatment Integrity Analyses

Participants took a brief five-question quiz after each of the two interventions. A paired-samples *t* test showed that there was no significant difference between these scores for the two interventions, t(30) = .53, p = .6, which indicates that there was an equal understanding of the two interventions.



**Figure 2.** Predicted pain tolerance gain for individuals high and low in psychological acceptance by intervention condition.

Note: On the basis of the regression equation, predicted values for pain tolerance gain are shown for individuals with high (i.e., one SD above the mean) and low (i.e., one SD below the mean) levels of psychological acceptance (as measured by the PHLMS). Predicted pain tolerance gain values are shown separately for the acceptance-based and the change-based intervention conditions

To assure that individuals with high versus low levels of psychological acceptance did not differentially apply the two strategies, the treatment integrity data were analyzed using a repeated-measure ANCOVA with acceptance as a covariate. No significant difference was found between participant-reported treatment usefulness for the acceptance versus the change-based interventions, F(1, 29) = 2.862, p = .101,  $\eta^2 = .09$ , nor for the degree to which participants reported that they applied the interventions, F(1, 29) = .699, p = .410,  $\eta^2 = .024$ . Therefore, individuals higher in psychological acceptance did not simply find the acceptance-based strategy more useful or easier to apply during the cold pressor test compared with individuals with lower levels of psychological acceptance.

# Discussion

Several previous studies have demonstrated an advantage for acceptancebased pain management interventions over change-based interventions for acute pain in analog paradigms, including the cold pressor task (Hayes, Bissett, et al., 1999; Keogh et al., 2005; McCracken & Eccleston, 2005, 2006; McMullen et al., 2008), though differences in the duration and content of the interventions have made interpretations problematic. The present withinsubjects results showed no significant overall difference between the efficacies of the two interventions. However, the effectiveness of these interventions is known to vary across individuals, which previous studies have not investigated. The present results demonstrate the moderating role of psychological acceptance in the effectiveness of acceptance- and change-based interventions for acute pain. Individuals high in acceptance not only had increased pain tolerance before any intervention but also showed significantly greater gains in pain tolerance after an acceptance-focused intervention, in comparison with individuals low in psychological acceptance. In particular, individuals high in acceptance exhibited greater gains in pain tolerance latency when using the acceptance-based intervention as compared with the change-based intervention, whereas individuals low in acceptance benefited more from the change-based intervention.

These results suggest that individuals benefit more from a particular intervention that is consistent with their natural coping style. Congruency between one's default coping mechanisms and those presented as a brief intervention likely provide individuals with an enhanced receptiveness to the given intervention. However, if an intervention is presented to an individual with an incongruent style of coping, it is conceivable that their readiness or openness to implement that strategy will be diminished. In addition, the moderating effect of acceptance in this study may, in part, be evident due to the brevity of the interventions.

Acceptance, but not awareness, was shown to significantly moderate intervention efficacy, which is consistent with previous studies. However, the current sample contained low reliability for the Awareness subscale, which could have potentially contributed to the lack of findings for mindful awareness in regard to pain tolerance; although this is unlikely based on the findings in the extant literature, which also found only acceptance to play a significant role in coping behavior (Herbert et al., 2010). In several ongoing studies, the acceptance subscale of the PHLMS at baseline has been shown to be a significant predictor of decreased test anxiety after treatment (Brown et al., 2011), increased HIV treatment adherence, decreased levels of anxiety in individuals with public-speaking phobia, and decreased social anxiety symptoms; these studies were reviewed by Herbert et al. (2010). Furthermore, these studies have shown that baseline awareness is not predictive of these positive therapeutic outcomes. Therefore, psychological acceptance of distressing experience, but not mindful awareness, seems to be the crucial component of mindfulness that predicts the effects of acceptance-based treatments across a variety of contexts.

With regard to interventions for pain, further investigation is needed to determine how these findings might generalize to a chronic pain population as well as to other psychological conditions. Inducing acute pain provides a safe and easy method to induce physical and psychological distress in a healthy sample, but results cannot be assumed to generalize to clinically significant pain without further investigation.

In summary, both acceptance- and change-based interventions improved tolerance of acute pain in this analog study; however, the efficacy of the interventions was moderated by baseline psychological acceptance. Continued exploration of treatment moderators suggests the possibility of tailoring treatment to individuals' natural coping style to enhance the efficacy and efficiency of psychological interventions.

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#### Note

1. The intervention scripts are available on request from the authors.

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