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The mediating role of pain acceptance during mindfulness-based cognitive therapy for headache

Melissa A. Day[a,*,1], Beverly E. Thorn[b]

[a] School of Psychology, The University of Queensland, Brisbane, Queensland, Australia
[b] Department of Psychology, The University of Alabama, Tuscaloosa, AL, USA

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ABSTRACT

Objectives: This study aimed to determine if mindfulness-based cognitive therapy (MBCT) engenders improvement in headache outcomes via the mechanisms specified by theory: (1) change in psychological process, (i.e., pain acceptance); and concurrently (2) change in cognitive content, (i.e., pain catastrophizing; headache management self-efficacy).
Design: A secondary analysis of a randomized controlled trial comparing MBCT to a medical treatment as usual, delayed treatment (DT) control was conducted. Participants were individuals with headache pain who completed MBCT or DT ($N = 24$) at the Kilgo Headache Clinic or psychology clinic. Standardized measures of the primary outcome (pain interference) and proposed mediators were administered at pre- and post-treatment; change scores were calculated. Bootstrap mediation models were conducted.
Results: Pain acceptance emerged as a significant mediator of the group-interference relation ($p < .05$). Mediation models examining acceptance subscales showed nuances in this effect, with activity engagement emerging as a significant mediator ($p < .05$), but pain willingness not meeting criteria for mediation due to a non-significant pathway from the mediator to outcome. Criteria for mediation was also not met for the catastrophizing or self-efficacy models as neither of these variables significantly predicted pain interference.
Conclusions: Pain acceptance, and specifically engagement in valued activities despite pain, may be a key mechanism underlying improvement in pain outcome during a MBCT for headache pain intervention. The theorized mediating role of cognitive content factors was not supported in this preliminary study. A large, definitive trial is warranted to replicate and extend the findings in order to streamline and optimize MBCT for headache.

1. Introduction

Headache pain affects approximately 45 million Americans and is among the most common complaints presenting in medical settings, accounting for 18 million physician visits per year in the United States.[1] Many professional organizations endorse cognitive-behavioral therapy (CBT) alongside pharmacotherapy as a first-line treatment approach for headache pain management.[2] However, effect sizes are modest and not all individuals experience clinically meaningful symptom relief.[3] The development of additional efficacious, non-pharmacological interventions that have the capacity to target the multidimensional nature of headache is needed for when an individual is not appropriately responding to the recommended first-line of care.

Mindfulness-based cognitive therapy (MBCT) integrates empirically supported psychological principles developed within CBT with mindfulness-based principles and may represent an additional, innovative treatment option for headache pain. MBCT maintains one of the strengths of CBT in that it includes cognitive-therapy oriented exercises to facilitate awareness of – and the links between – cognitions, emotions, behaviors, and physical sensations.[4] Concurrently, mindfulness meditation and other mindfulness exercises are taught to further develop this mindful awareness of experience. Moreover, meditation cultivates a non-judgmental, accepting attitude towards all experience, including pain. Recent preliminary results of an initial pilot, randomized controlled trial (RCT) of MBCT for headache pain found that this approach is feasible, tolerable, and efficacious.[5] Compared to a medical treatment as usual, delayed treatment control (DT),

* Corresponding author at: The University of Queensland, 330 McElwain Building, Brisbane, Queensland 4072, Australia. Fax: +61 7 3365 4466.
E-mail address: m.day@uq.edu.au (M.A. Day).
[1] Web: www.psy.uq.edu.au.

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individuals completing MBCT reported significantly improved pain interference, pain acceptance, pain catastrophizing, and headache management self-efficacy.[5]

To determine the true public health value of MBCT and other psychological approaches for pain management, it is essential that the mechanisms of any observed treatment effects be examined and evaluated in relation to the purported theory underlying the specific treatment approach under investigation.[6,7] Jensen and colleagues.[7,8] recently proposed an organizational framework that distinguished cognitive mediating factors as encapsulating either cognitive content (i.e., *what* an individual thinks about pain), and cognitive process (i.e., *how* an individual thinks about pain). While a cognitive conceptualization of CBT maintains that a key mechanism of this approach is reduction in maladaptive cognitive content (e.g., pain catastrophizing) and improvement in adaptive content (e.g., self-efficacy), a mindfulness perspective proposes that change in cognitive processes (e.g., mindfulness, pain acceptance[1]) is central to interventions based on mindfulness principles. The integrated nature of MBCT, theoretically, is designed to target *both* cognitive content and process-related variables in order to improve pain outcomes.

The purpose of the current, secondary analysis of data obtained in the initial MBCT for headache pain pilot study (described above)[5] was to conduct an investigation into whether MBCT engenders improvement in pain outcome via the mechanisms specified by theory. Prior quantitative analyses investigated the feasibility and efficacy of MBCT for headache, but not the mechanisms through which beneficial effects were wrought. This is the first study to examine mediation in an MBCT for pain intervention. Based on the results of the initial RCT,[5] several possible mediation effects that had the potential to meet Baron and Kenny's [9] criteria for mediation were examined. While both mindfulness and pain acceptance are theorized as specific process mechanisms of MBCT, as reported in the original trial,[5] only pain acceptance emerged as significantly improved from pre- to post-treatment in MBCT compared to DT. Thus, Aim 1 of the current study was to examine the mediating role of pain acceptance, and not mindfulness. Given MBCT integrates CBT principles and theoretically also targets change in cognitive content, and that a group effect was found for both pain catastrophizing and headache management self-efficacy in the original trial, Aim 2 of the current study was to examine the mediating role of these cognitive content variables. The primary outcome for all current analyses was pain interference, which is the recommended outcome variable for trials of mindfulness-based interventions.[10]

2. Methods

2.1. Research design

The original study compared MBCT to a treatment as usual, delayed treatment control (DT) via a parallel group, un-blinded, randomized controlled trial (RCT) within a headache pain population.[5] Initial screening was conducted over the phone, and the 8-week, group delivered MBCT intervention took place at the Kilgo Headache Clinic, or the University of Alabama Psychology Clinic. This research was approved by the Institutional Review Board at the University of Alabama, and informed consent was obtained with all patients prior to participation. For additional details, see the original trial.[5]

2.2. Participants

Participants were adults with a primary headache pain type recruited through referral by a physician or self-identified via posted brochures and public service announcements. A total of $N = 36$ participants were randomized to condition ($n = 19$ MBCT; $n = 17$ DT), and 24 participants completed MBCT (i.e., attended ≥ 4 sessions and the pre- and post-treatment assessment; $n = 9$ MBCT) or the DT control (i.e., completed assessments at pre- and post-treatment; $n = 15$ DT). As the aim of the present secondary analyses was to examine treatment mechanism, the 24 participants who completed MBCT or DT were used in all analyses. The CONSORT flow diagram and a detailed description of the inclusion/exclusion criteria and sample characteristics can be found in the original report.[5]

2.3. MBCT intervention protocol

In conducting the original trial,[5] an existing 8-week MBCT for depression protocol [4] was adapted for headache pain to incorporate knowledge about the specific issues of relevance and importance to a headache pain population. The MBCT for headache intervention was group delivered and consisted of eight 2-h sessions. Each session included experiential exercises, guided inquiry and group discussion. Participants were encouraged to practice meditation in between group sessions for 45-min, 6 days per week. Other brief cognitive-behavioral and mindfulness exercises were also assigned for homework. See the original trial for protocol details.[5]

2.4. Outcome measure

The Brief Pain Inventory (BPI) was implemented to assess pain interference.[11] The BPI has adequate internal consistency ($\alpha = 85$) in a variety of pain populations and concurrent validity with other pain instruments.[11] In the current sample, the BPI-interference scale had adequate internal consistency ($\alpha = 89$).

2.5. Mechanism Measures

The Chronic Pain Acceptance Questionnaire (CPAQ) sum score was used to assess pain acceptance, as well as the subscales of Activity Engagement and Pain Willingness.[12] As mentioned in Vowles et al., the CPAQ seems to be a reliable measure for assessing chronic pain acceptance. Internal consistency for the CPAQ sum score, Activity Engagement and Pain Willingness subscales was adequate in the current study (α's = 77, .87, and .77, respectively). The Pain Catastrophizing Scale (PCS) was used to assess catastrophic thinking about pain.[13] Sullivan et al. showed that the PCS has strong internal consistency ($\alpha = .93$), concurrent and discriminant validity. Adequate internal consistency was found in the current sample ($\alpha = 91$). Self-efficacy for the prevention and reduction of headache pain was assessed using the Headache Management Self-Efficacy scale (HMSE)[14] The HMSE has been shown to have excellent internal consistency ($\alpha = 90$). Internal consistency in the current sample was adequate ($\alpha = 82$).

2.6. Analyses

SPSS version 22.0 was used in all analyses.[15] Change scores for the outcome and mediator variables were computed by subtracting the post-treatment score from the pre-treatment score. A series of bootstrap mediation models were conducted with $n = 5000$

[1] It is important to note that pain acceptance, as measured by the Chronic Pain Acceptance Questionnaire (CPAQ), encapsulates a multidimensional construct, of which cognitive process is only one aspect; pain acceptance also entails processes of behavioral openness and engagement. Hence, given acceptance as measured by the CPAQ is not a pure cognitive process construct only, henceforth we refer to pain acceptance via the term "psychological process".