



## Differential effects of mindful breathing, progressive muscle relaxation, and loving-kindness meditation on decentering and negative reactions to repetitive thoughts

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### ABSTRACT

Decentering has been proposed as a potential mechanism of mindfulness-based interventions but has received limited empirical examination to date in experimental studies comparing mindfulness meditation to active comparison conditions. In the present study, we compared the immediate effects of mindful breathing (MB) to two alternative stress-management techniques: progressive muscle relaxation (PMR) and loving-kindness meditation (LKM) to test whether decentering is unique to mindfulness meditation or common across approaches. Novice meditators (190 female undergraduates) were randomly assigned to complete one of three 15-min stress-management exercises (MB, PMR, or LKM) presented by audio recording. Immediately after the exercise, participants completed measures of decentering, frequency of repetitive thoughts during the exercise, and degree of negative reaction to thoughts. As predicted, participants in the MB condition reported greater decentering relative to the other two conditions. The association between frequency of repetitive thought and negative reactions to thoughts was relatively weaker in the MB condition than in the PMR and LKM conditions, in which these two variables were strongly and positively correlated. Consistent with the construct of decentering, the relative independence between these two variables in the MB condition suggests that mindful breathing may help to reduce reactivity to repetitive thoughts. Taken together, results help to provide further evidence of decentering as a potential mechanism that distinguishes mindfulness practice from other credible stress-management approaches.

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During the past twenty years, a body of literature has emerged supporting the efficacy of mindfulness-based treatment approaches for both mental and physical illness (for reviews, see Baer, 2003; Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Greeson, 2009; Hofmann, Sawyer, Witt, & Oh, 2010). Given the promise of mindfulness as an intervention strategy, there has been a call to direct research towards understanding the mechanisms of mindfulness-based interventions (Roemer & Orsillo, 2003; Shapiro, Carlson, Astin, & Freedman, 2006; Williams, 2008). Decentering is emphasized as a mechanism of mindfulness-based cognitive therapy for depression (MBCT, Segal, Williams, & Teasdale, 2002), in which a patients learn to view thoughts as events in the mind rather than necessarily being reflections of reality or accurate self-view. Decentering involves viewing internal experience with increased objectivity; thus, the emphasis is on changing one's relationship to one's thoughts rather than trying to alter the content of the thoughts

(Fresco et al., 2007; Safran & Segal, 1990).<sup>1</sup> In an integrative theory of the mechanisms of mindfulness, Shapiro et al. (2006) proposed that this ability to "reperceive" one's own thought processes may in turn facilitate a tendency to respond to internal and external experiences with less emotional reactivity (Shapiro et al., 2006).

Decentering may be especially relevant in explaining how mindfulness training may decrease depressive rumination. Depressive rumination involves recurrent, passive thoughts about one's distress and the circumstances contributing to it (Nolen-Hoeksema, 1991) and has been found to contribute to a range of clinical problems including depression, anxiety, binge eating, binge drinking, and self-harm (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Depressive rumination can be understood as an ineffective attempt to resolve discrepancies between current and desired states (Watkins, 2008; see also Treynor, Gonzalez, &

<sup>1</sup> Similarly, in Acceptance and Commitment Therapy (ACT, Hayes, Strosahl, & Wilson, 1999), a range of techniques including mindfulness meditation are used to help patients develop cognitive defusion, also referred to as the deliteralization of thoughts.

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Nolen-Hoeksema, 2003). In mindfulness-based cognitive therapy for depression (Segal et al., 2002), individuals with a history of depression are taught to recognize and disengage from unproductive discrepancy-based repetitive thoughts (e.g., self-criticism, regrets about past events) in order to reduce vulnerability for depression relapse (see also Crane et al., 2008; Williams, 2008).

The relationship between mindfulness and rumination has been a focus of increasing empirical study. In cross-sectional observational studies, both dispositional and state measures of mindfulness are inversely associated with dispositional measures of rumination and other constructs reflecting recurrent, discrepancy-based thought (Brown & Ryan, 2003; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007; Lau et al., 2006). In clinical studies, participants who receive mindfulness training show significant decreases in rumination (Deyo, Wilson, Ong, & Koopman, 2009; Kumar, Feldman, & Hayes, 2008; Ramel, Goldin, Carmona, & McQuaid, 2004). The decrease in rumination among individuals receiving mindfulness training has been found to be greater than for those randomized to a control group (Jain et al., 2007). These clinical studies document that mindfulness training may ultimately reduce ruminative thinking but leaves open the question of how and why this occurs. For instance, it is unclear if this occurs due to participants changing their relationship to these ruminative thoughts, as suggested by the construct of decentering. This possibility is suggested by two non-controlled studies of patients enrolled in mindfulness-based stress reduction courses, which have found that decentering increased pre- to post-intervention when assessed as both a state (Lau et al., 2006, Study 2) and dispositional trait (Carmody, Baer, Lykins, & Olendzki, 2009).

Experimental laboratory studies can valuably complement the understanding of mechanisms of mindfulness gained from clinical studies of full mindfulness-based intervention approaches (Roemer & Orsillo, 2003; Williams, 2008). Initial experimental studies with novice meditators have compared brief mindful breathing exercises to other comparison conditions including rumination and distraction (Broderick, 2005) and worry and unfocused attention (Arch & Craske, 2006). Results suggest that mindfulness may aid in recovery from a dysphoric mood induction (Broderick, 2005). Furthermore, the Arch and Craske (2006) study found that mindfulness training facilitated less emotional reactivity and increased willingness to engage in an affectively distressing task. However, these studies did not explicitly examine whether mindfulness meditation resulted in decentering from internal experiences.

More recently, laboratory-based studies have begun to examine constructs related to decentering as an outcome. A study of an unselected student sample (Frewen, Evans, Maraj, Dozois, & Partridge, 2008) found that trait mindfulness was predictive of decreased frequency of negative automatic thoughts as well as higher perceived ability to disengage from (or “let-go” of) negative thoughts during a 15-min mindfulness exercise. That study made the contribution of examining both frequency and response to thoughts as separate constructs; however, it did not include a control group leaving open questions about the specific effect of mindfulness meditation on frequency of negative thoughts or reactions to them. In a related line of research, studies have examined predictors and correlates of decentering immediately after practice of mindfulness meditation (Lau et al., 2006, Study 1; Ortner, Kilner, & Zelazo, 2007, Study 1; Thompson & Waltz, 2007). In those studies, decentering was assessed by the Toronto Mindfulness Scale (TMS, Lau et al., 2006).<sup>2</sup> However, like the Frewen et al.

(2008) study, those two studies did not include a control or comparison group. Recently, Erisman and Roemer (2010) found that brief mindful exercises including mindful breathing produced greater decentering on the TMS than a neutral control condition consisting of listening to educational recordings and completing mental puzzles.

In sum, laboratory studies of mindful breathing to date have either not examined decentering as an outcome, done so using observational designs, or used experimental designs with inactive control conditions or comparison conditions that would be expected to be distressing (e.g., worry, rumination). As such, it remains an open question whether mindful breathing would result in greater decentering than other credible relaxation or meditation exercises. This limitation is consistent with recent critiques of the mindfulness-based intervention literature which have highlighted the need to establish what processes and outcomes distinguish mindfulness training from other active treatments (Coelho, Canter, & Ernst, 2007; Toneatto & Nguyen, 2007), especially relaxation training (Roemer & Orsillo, 2003).

As such, the goal of the present study was to test the hypothesis that mindful breathing has a unique effect on decentering (especially from repetitive thoughts) compared to two other popular stress-management approaches. Specifically, we compared the immediate effects of mindful breathing (MB) to two alternative stress-management techniques, progressive muscle relaxation (PMR) and loving-kindness meditation (LKM), in a non-clinical sample of novice meditators. We selected these two comparison conditions because like MB, both PMR and LKM have been incorporated into multi-week clinical interventions (e.g., Bernstein & Borkovec, 1973; Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008) but also lend themselves to stand-alone experimental manipulations that can be presented in a single session (e.g., Avants, Margolin, & Salovey, 1990; Hutcherson, Seppala, & Gross, 2008). All three would be expected to produce feelings of relaxation and could be conceptualized as stress-management exercises. However, the essential goal of MB differs from PMR and LKM. Whereas the objective of PMR is to increase sensations of physical relaxation and LKM is designed to increase feelings of social connection and compassion for one's self and others, MB is not designed to actively change physical or emotional states, but instead to observe and accept current internal experiences as they are while maintaining a primary focus on the breath sensations.

We assessed frequency of different forms of repetitive thoughts that occurred during the meditation and relaxation exercises (henceforth referred to as simply ‘exercises’). Repetitive thought (RT) is a broad construct reflecting the “process of thinking attentively, repetitively, or frequently about one's self and one's world” (Seegerstrom, Stanton, Alden, & Shortridge, 2003, p. 909) with the goal of reducing discrepancy between current and desired states (Watkins, 2008, see also Martin & Tesser, 1996). In this study, we chose to examine a range of RT including aspects of depressive rumination (e.g., self-criticism, regrets over past experience), but also constructs such as worry, planning, and problem-solving given that this may be more relevant in a non-clinical sample than restricting responses to depressed mood specifically as articulated in the Response Style Theory (RST, Nolen-Hoeksema, 1991).<sup>3</sup> Repetitive thoughts about negatively-valenced content tend to be associated with poorer outcomes (e.g., distress); however, this may be moderated by the ways in which individuals approach their thoughts (Watkins, 2008). This is highly consistent with mindfulness training (Kabat-Zinn, 1990) in which RT processes are viewed

<sup>2</sup> The Thompson and Waltz (2007) and Ortner et al. (2007) studies used an earlier version of the TMS that was scored as a single total score. As such, it did not specifically examine the construct of decentering; however, the items used to calculate the total score included many of the items that later were used to create the decentering subscale.

<sup>3</sup> Furthermore, measures of specific aspects of RT tend to be highly intercorrelated, suggesting that it may be valuable to apply this broader conceptualization (Watkins, 2008).

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