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Mindfulness and emotion regulation

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One proposed pathway for the documented psychological effects of mindfulness (cultivating awareness and acceptance of the present moment) has been through its facilitation of adaptive emotion regulation (ER). Although conceptual overlap between the two constructs complicates interpretation of correlational findings, an emerging body of laboratory, experimental, and treatment outcome studies provides preliminary support of proposed conceptual models. These findings indicate that the practice of mindfulness is associated with healthy ER (e.g., reduced intensity of distress, enhanced emotional recovery, reduced negative self-referential processing, and/or enhanced ability to engage in goal-directed behaviors) and may play a causal role in these effects. More experimental and longitudinal research is needed to determine the exact nature, temporal unfolding, and causality of these associations.

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Introduction

Mindfulness, a psychological construct drawn from Buddhist traditions, has been defined in secular contexts as 'paying attention, on purpose, in the present moment, non-judgmentally [1].' It is most often conceptualized as containing at least two elements, awareness of the present moment and the quality of that awareness (accepting, kind, nonjudgmental, curious; e.g., [2], while the currently most commonly used self-report measure assesses five dimensions (observing, describing, acting with awareness, nonjudgment, and nonreactivity [3]. Mindfulness is used to refer to a dispositional quality that varies among individuals, brief practices that may elicit this quality or way of responding, as well as treatment programs or lifelong practices that promote this dispositional quality. One proposed pathway for the documented psychological effects of mindfulness has been through its facilitation of adaptive emotion regulation (ER) [4]. An in-depth review of the conceptual and methodological complexities in the relations among these two psychologically important constructs is beyond current space constraints (see [5,6••,7••] for in depth reviews), however we will highlight central considerations and findings in this important area of study.

ER refers to the 'process by which individuals influence which emotions they have, when they have them, and how they experience and express [them]' ([8], pp. 275) with an emphasis on modulation rather than elimination of emotional responses and adaptive behavioral responses to the environment [9,10]. The process model of ER [8] highlights that emotions can be regulated at multiple stages from situation selection and modification, to attention to specific aspects of the situation, to reappraisal of a context (or emotional response) [11], to attempts to modify emotional responses (facial expressions, physiological, experiential, and/or behavioral). While extensive research has examined specific ER strategies (most often cognitive reappraisal and expressive suppression, see [11,12] for reviews), researchers have emphasized the importance of better understanding the ongoing process of ER [13], context-dependence in the effectiveness of strategies [9], and regulatory flexibility [14], as well as the specific processes of ER among individuals who present with clinical disorders [15].

Conceptual links between mindfulness and ER

A host of researchers have proposed conceptual links between mindfulness practices and adaptive ER. By promoting enhanced and expanded attention and awareness in the present moment, mindfulness may improve individuals' ability to attend to specific aspects of a situation (e.g., expanding beyond a narrow focus on threat [16•,17]), as well as aspects of their own experience (e.g., body awareness [18•]), and therefore improve their detection of the need to implement (or adjust) regulation strategies [19]. This expanded awareness may also enhance inhibitory learning [20], so that a previously feared stimulus becomes associated with (predictive of) absence of threat, countering previous associations of threat and resulting in decreased anxious responding. Further, the quality of this awareness (nonjudgmental, curious, compassionate) may alter individuals' way of relating to their own internal experiences (thoughts, feelings, sensations, memories) in ways that impact regulation. This 'reperceiving' [21], decentering [22], or acceptance [19] may directly reduce the intensity of emotional responses [7••], increase affect tolerance [23] and reduce negative valuation of emotional responses [7••]. It may also function as exposure (i.e., inhibitory learning; [18•,20,24]) so that

new, nonthreatening associations with internal experiences are learned that counteract previous learned threatening associations. It may also increase positive reappraisal of situations [25] and reduce the automatic self-referential processing (e.g., worry, rumination, self-criticism) that often perpetuates emotional distress, particularly among individuals with emotional disorders [23,26]. This quality of awareness may also facilitate the flexible use of strategies to regulate emotions [7••] and/or enhance individuals' ability to engage in actions that matter to them (and refrain from impulsive actions) even while experiencing intense emotions (e.g., [10]), an understudied type of response-focused regulation.

Many authors note that mindfulness may affect ER differently at different stages of practice. For instance, Hayes and Feldman [27] suggest that mindfulness may initially reduce distress, while it may also subsequently, after practice, enhance an open experiencing of emotions (i.e., exposure to emotions), which promotes new emotional learning and reestablishes adaptive ER among those presenting with emotional disorders. Differences related to length of practice may explain some apparent contrasts in the literature: Chambers *et al.* [5] distinguish mindfulness from cognitive regulation, stating that mindfulness does not involve endorsing alternative cognitive beliefs, but instead relating differently to beliefs as a whole. Teper *et al.* [19] and others make similar distinctions. On the other hand, Webb *et al.* [11] categorize mindfulness as a reappraisal strategy, suggesting that mindfulness (and acceptance) involves a reappraisal of an emotional response, and Garland *et al.* [25] suggest mindfulness involves positive reappraisal of contexts. These differing models may be explained by differences in the impact of mindfulness when initially learned (when it may be more of a top-down, cognitive, regulatory process), and after extensive practice (for instance among experienced meditators, see [6••,18•] for reviews), when it may instead lead to a different way of initially responding to emotions and beliefs. Chiesa *et al.* [6••] provide an in-depth review of research to date (some of which is also reviewed here), concluding that when initially practiced, mindfulness may lead to recruitment of prefrontal cortex areas that modulate activation in limbic areas (indicating top-down, regulatory processing), while cross-sectional studies of experienced meditators find evidence of reduced activation in limbic areas in the absence of corresponding activation in the prefrontal cortex (indicating bottom-up processing, or reduced reactivity). They note, however, that both top-down and bottom-up processes may also operate concurrently among some individuals (and vary based on context) and that more research is needed to examine the time course of development of these processes. Distinct mindfulness practices may also differ in whether they enhance top-down regulatory strategies (including, but perhaps not limited to, reappraisal), or target reactivity more directly [6••,18•].

Correlational studies of self-report measures

Empirical investigation of the relations between mindfulness and ER is complicated by varied conceptual and operational definitions of both. One point of confusion is whether mindfulness and ER are distinct or overlapping constructs, or whether mindfulness is an example of an ER strategy. This has led to measurement challenges in correlational studies of self-report measures as some multi-dimensional measures of mindfulness include aspects of ER (e.g., nonreactivity to internal experiences, [3]), while some multi-dimensional measures of ER incorporate factors that could be considered facets of mindfulness (e.g., nonacceptance (inversely) in the Difficulties in Emotion Regulation Scale; [10], see [28] for in depth discussion). Nonetheless, correlational studies in undergraduate, healthy adult, and treatment-seeking samples consistently find associations among both unidimensional (awareness only) and multidimensional measures of mindfulness and measures of ER (e.g., [29,30]), including a unique relationship beyond shared variance with anxiety sensitivity, distress tolerance, and negative affect [31]. Studies also find that various measures of ER explain associations between mindfulness and psychological outcomes (e.g., [32]) and also mindfulness and difficulties in ER explain both unique and overlapping variance in psychological symptoms (e.g., generalized anxiety disorder, [33]). In an experience sampling study, a multidimensional measure of mindfulness was positively correlated with emotion differentiation and negatively correlated with emotional lability in a sample of undergraduate students; and emotion differentiation explained the shared variance between mindfulness and emotional lability [34]. Adams *et al.* [35] similarly found that dispositional mindfulness (unidimensional — awareness) was significantly correlated with reduced emotional volatility in a sample of African American individuals during a smoking cessation program.

To address potential overlap in measures of mindfulness and ER, Coffey *et al.* [28] conducted a series of exploratory and confirmatory factor analyses of the subscales of commonly used multi-dimensional measures of each construct in an undergrad sample, revealing a four factor model of awareness, acceptance, clarity, and negative ER, with each factor including subscales from both the mindfulness and ER measures. A path analysis indicated that awareness and acceptance (both established components of mindfulness) each directly and independently predicted both clarity and negative ER, and clarity also predicted negative ER. A follow-up study revealed that acceptance was the strongest predictor of both positive and negative psychological outcomes and that negative ER was strongly associated with both acceptance and psychological outcomes. These studies and others like them indicate strong relations between self-reported mindfulness and ER, and begin to suggest that acceptance may be strongly associated with both healthy