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The exploration of mindfulness and its relation to emotions and emotion regulation is a widely researched area of the mindfulness literature. It is broadly acknowledged that mindfulness has a large impact on the awareness and labeling of emotions, the experience of emotions, and the level of positive and negative emotions that are experienced. As a result, varied conceptualiza-

tions of mindfulness include processes that relate to emotion regulation specifically. In this chapter, we begin by noting the implications for emotions and emotion regulation in a variety of models of mindfulness. Then, to highlight the wealth of research linking mindfulness to emotion regulation, we provide an overview of the role of mindfulness in general emotional states, emotional reactions to stimuli and events, and emotions over time. Importantly, however, in this chapter we will go beyond emotion regulation as an outcome of being mindful, and we will begin to link the impact of mindfulness on emotion regulation to behavioral change. Specifically, by highlighting research on smoking, alcohol use, and other addictive behaviors, we will demonstrate that emotion regulation serves as a key mechanism in the relationship between mindfulness and some domains of behavioral regulation.

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Conceptualizations of Mindfulness and Its Role in Emotion Regulation

Consensus about an empirical definition of mindfulness is still lacking. As a result, a number of operational definitions and conceptual models of the broad construct of mindfulness exist. Below, we describe several definitions/models of mindfulness, highlighting the aspects of each that relate to emotion regulation and models of emotion regulation.

Brown and Ryan (2003) have advanced a uni-dimensional notion of mindfulness as “enhanced attention to and awareness of current experience or present reality” (p. 822). This singular and largely cognitive conceptualization ties high levels of mindfulness to emotion regulation by comparing mindfulness to constructs such as emotional intelligence and openness to experience and by describing a mindful mode of operation as an “open” or “receptive” attention and awareness that produces clarity of and receptivity toward emotions.

Other definitions of mindfulness include this cognitive component of attention and awareness as part of a larger system, as one of several theoretical subcomponents of which one or more are directly implicated in emotion regulation. Bishop et al. (2004) discuss mindfulness in terms of (1) the self-regulation of attention, and (2) an orientation to experience characterized by curiosity and openness to experience. Importantly, this second facet includes a curiosity and acceptance toward thoughts, feelings, and experiences that enter conscious awareness. Shapiro, Carlson, Astin, and Freedman (2006) reflect this same orientation to experience as a quality of “attitudes,” one of three axioms (along with “intention” and “attention”) which comprise mindfulness. The attitude necessary for mindful intention and attention includes compassion and openness, such that mindful experience of emotions becomes “the capacity not to continually strive for pleasant experiences, or to push aversive experiences away” (p. 377). From both of these perspectives, noticing and accepting emotions in this way over time would predict further experience of emotions (i.e., less avoidance of emotions), greater tolerance of emotional states, increased complexity of emotional representations (e.g., emotion differentiation), and less reactivity to emotions (i.e., lower likelihood of impulsive responses to emotions).

Leary, Adams, and Tate (2006) position mindfulness as a mode of “hypo-egoic regulation,” whereby self-regulation occurs without a focus on the self. Hypo-egoic states are characterized by low self-awareness (in terms of the self as an object of reflection) and/or self-thoughts that are

concrete and present-focused. Meditation is one suggested avenue for cultivating hypo-egoic states, whereby conscious thoughts are observed without reacting to them, and over time self-conscious thoughts decrease in number and intensity. Mindful states specifically are posited to reduce abstract and self-evaluative thoughts. The authors state “Often, people misregulate because they resist the reality in which they find themselves” (p. 1823). In contrast, mindfulness promotes acceptance of the current reality, including one’s current emotional state. In addition, mindfulness involves focus on the present in concrete ways, which should reduce rumination and reactivity to experienced emotions. Cast in the light of the hypo-egoic regulation framework, highly mindful individuals should exhibit reduced self-conscious reflection on emotion, instead observing and accepting their emotions without attempting deliberate control of their emotional states; this lack of self-conscious, deliberate control should facilitate effective emotion regulation.

Mindfulness has been studied as a naturally occurring individual difference (i.e., *trait or dispositional mindfulness*), which refers to an individual’s tendency to observe and accept present-moment experiences in day-to-day life (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Brown & Ryan, 2003). Researchers have also examined effects of short exercises (i.e., *mindfulness inductions*) and training programs (i.e., *mindfulness-based treatment*) intended to increase mindfulness. Although differences likely exist among these operation definitions of the theoretical construct of mindfulness, trait mindfulness, mindfulness inductions, and mindfulness-based treatments appear associated with improved emotion regulation, as will be discussed below. In fact, mindfulness-based treatments often specifically address or implicate emotion regulation.

Mindfulness-based Stress Reduction (MBSR; Kabat-Zinn, 1982, 1990) teaches mindfulness skills through mindfulness meditation exercises. These exercises encourage thoughts and feelings to be observed nonjudgmentally, without becoming absorbed in their content (Kabat-Zinn, 1982).

Through repeated nonjudgmental observation of feelings, an individual learns that emotions are transient states. In Mindfulness-based Cognitive Therapy (MBCT; Teasdale et al., 2000), this same approach of observing thoughts, emotions, and sensations nonjudgmentally is bolstered by a focus on “decentering” or detaching from one’s thoughts and emotions. In this way, depressed individuals learn that negative emotions are transient states and that their negative emotions are separate from “self,” which over time mitigates the consuming nature of negative emotions and thoughts. In Dialectical Behavior Therapy (DBT; Linehan, 1993) clients are taught mindfulness skills that are similar to skills gained from MBSR programs, including “observing,” “describing,” and “nonjudgment.” As a treatment for Borderline Personality Disorder, which is characterized by extreme emotional instability, DBT targets emotion regulation directly by encouraging the synthesis of “dialectical” forces of acceptance of one’s current state and change toward a better state. Acceptance and Commitment Therapy (ACT; Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes, Strosahl, & Wilson, 1999) also encourages mindful acceptance of emotional states, particularly emphasizing the separation of thoughts, emotions, and sensations from the self-as-observer. This separation of thoughts from self allows for objective distance from emotions, thereby decreasing their impact on experience. Notably, mindfulness can be taught and encouraged through meditation (as is largely the case with MBSR and MBCT) as well as mindfulness exercises that do not necessarily involve meditation per se (as in DBT and ACT).

Mindfulness-based treatments have also been developed and applied to the treatment of substance use disorders. For example, Mindfulness-based Addiction Treatment (MBAT; Vidrine et al., 2015), based largely on MBCT, aims to help individuals to (1) become more aware of thoughts, feelings, and sensations from moment to moment, (2) develop a different way of relating to thoughts, feelings, and sensations, and (3) obtain the ability to disengage attention and choose skillful responses to any thoughts, feelings, or situations that arise. Similarly,

Mindfulness-based Relapse Prevention (MBRP; Witkiewitz & Marlatt, 2004) encourages increased awareness of thoughts, emotions, and sensations that characterize high-risk situations for relapse to substance use, thereby allowing individuals to notice their often automatic urges for substance use and to choose not to use the addictive substance. A primary motive for returning to substance use among those who have quit is relief from negative affect (Baker, Brandon, & Chassin, 2004), so mindful emotion regulation serves to increase the likelihood of continued abstinence. (For further reference, see Baer, 2003, where many of these programs are reviewed in greater detail and in a broader context [i.e., not focused on emotion regulation].)

In summary, across varied theoretical conceptualizations of mindfulness as well as mindfulness-based programs and interventions, emotion regulation is consistently implicated as a consequence of fostering a mindful state. However, what evidence exists linking mindfulness to emotion regulation? Below, we briefly review some evidence linking mindfulness to positive and negative emotional states, as well as evidence linking mindfulness to the regulation of emotion following emotional stimuli, emotional events, and emotional states over time. Within this review, we highlight multiple avenues through which mindfulness benefits the regulation of emotions including: increased willingness to experience negative emotions, reduced reactivity to emotional stimuli and situations, dampened self-conscious emotions and self-esteem involvement, increased stability in emotions over time, and activation (or deactivation) of consistent brain areas early in the time course of affective processing.

Empirical Relations of Mindfulness with Emotion Regulation

An abundance of research exists linking high levels of mindfulness, or increases in mindfulness through training, to *lower levels of negative affect and higher levels of positive affect*. This robust finding occurs across varying samples (clinical

and non-clinical), varying ages (youth/adolescents through adults), and varying conceptualizations of mindfulness (especially dispositional and treatment). Some examples include: in cancer patients, mindfulness training predicted reduced anxiety, depression, and anger, and increased vigor (e.g., Speca, Carlson, Goodey, & Angen, 2000); across a range of clinical populations, mindfulness-based training programs are effective for a number of disorders marked by emotion dysregulation (see Baer, 2003, for a review); in healthy individuals, trait mindfulness has predicted self-reported affect (e.g., Brown & Ryan, 2003), and mindfulness meditation has predicted increased prefrontal activation asymmetries suggestive of temperamental shifts toward greater positive affect (Davidson et al., 2003); and in youth/adolescent psychiatric patients, self-reported trait mindfulness has predicted less negative affect and greater positive affect, happiness, and life satisfaction (Brown, West, Loverich, & Biegel, 2011) and mindfulness training reduced anxiety and depression (Biegel, Brown, Shapiro, & Schubert, 2009). Another testament to the robust nature of this relationship between mindfulness and lower negative/higher positive affect is that it emerges across methodologies—in cross-sectional designs, short-term longitudinal designs, and pre-test/post-test designs.

In addition to promoting higher positive affect and lower negative affect, mindfulness appears to enhance the regulation of unpleasant affective states. This evidence comes from experimental and quasi-experimental studies that examine links between mindfulness and responses to valenced stimuli and situations. Consistent with the conceptual models including nonjudgmental or non-attached awareness of negative states, some studies link mindfulness to *increased willingness to experience or stay with negative emotions*. In one study, a brief (15 min) mindfulness induction impacted responses to neutral and negative affective stimuli (Arch & Craske, 2006). Specifically, participants who underwent unfocused attention or worry inductions responded more negatively to neutral slides post-induction, while those in the focused breathing induction maintained moderately positive responses.

Importantly, individuals who underwent a focused breathing task exhibited greater willingness to view highly negative pictures during an optional portion of the experiment.

Similarly, in another series of studies, highly mindful individuals exhibited a pattern of behavior consistent with greater nonjudgmental attention and awareness of existential threat. Niemiec et al. (2010) examined mindfulness in the context of terror management theory (Greenberg, Solomon, & Pyszczynski, 1997), which posits that when people's mortality is made salient to them, a host of defensive processes ensue collectively termed "worldview defense." These defenses include proximal defenses such as suppression of thoughts of one's own mortality, as well as distal defenses such as a cultural worldview and self-esteem. Niemiec et al. (2010) demonstrated that highly mindful individuals suppressed thoughts of death to a lesser extent following a mortality salience manipulation (i.e., describing thoughts of their own death and what happens to them when they die) than less mindful individuals, and that highly mindful individuals were willing to write about their own deaths for a longer period of time.

Importantly, theoretical and empirical work from a broad literature suggests that an increased willingness to experience negative emotions will benefit emotion regulation. For example, cognitive research on ironic suppression effects suggests that attempts to "not think about a white bear" actually increase those same prohibited thoughts (Wegner et al., 1987; Wenzlaff & Wegner, 2000), thus attempting to ignore or deny unpleasant thoughts and feelings can make them more influential. Similarly, a number of effective therapies discussed here (e.g., DBT, MBCT), as well as validated models of addictive behaviors (e.g., Baker, Piper, McCarthy, Majeskie, & Fiore, 2004), suggest that noticing and, thus, experiencing (negative) feelings is an important pre-cursor to responding to situations flexibly and adaptively (e.g., choosing not to use a substance in the presence of an urge; we return to this issue below).

Mindful emotion regulation appears to be characterized by a *reduced reactivity to emo-*

tional stimuli and situations (Arch & Craske, 2010; Britton, Shahar, Szepsenwol, & Jacobs, 2012; Raes, Dewulf, Van Heeringen, & Williams, 2009). Raes et al. (2009) found that high levels of trait mindfulness were inversely related to cognitive reactivity to sad moods, and that MBCT reduced cognitive reactivity from pre-test to post-test, compared to a wait-list control group. Similarly, participants in an MBCT program exhibited decreased emotional reactivity following the Trier Social Stress Test, and a lack of anticipatory anxiety that was present in the control group (Britton et al., 2012). This reduced emotional reactivity to stress partially mediated improvements in depressive symptoms found in the MBCT group. In a sample of clinically anxious and control participants, trait mindfulness predicted lower negative affect and anxiety following a breathing task designed to mimic hyperventilation (Arch & Craske, 2010). The contribution of mindfulness to affective responses was over and above the contributions of anxiety and depression levels. Further probing revealed that the effect of trait mindfulness on post-stressor negative affect was present for individuals high in anxiety sensitivity but not for those low in anxiety sensitivity. In addition, reflective of the increased willingness to experience negative emotions discussed above, trait mindfulness was correlated positively with duration in the hyperventilation-breathing task when participants were encouraged to continue as long as they were able (Arch & Craske, 2010).

Of note, studies linking mindfulness to reduced emotional reactivity to specific stimuli or events have done so almost exclusively with *negative* stimuli or events. It is plausible, then, that highly mindful individuals are also less happy, joyful, proud, etc., when they experience positive events such as winning an award or receiving a compliment. To our knowledge, no studies address this point directly; however, at least one study suggests that mindful individuals display less variability in both positive and negative emotions in the course of their daily lives (Hill & Updegraff, 2012). However, whereas the positive effects of pleasant experiences are typically fleeting and much less

powerful than negative experiences, a phenomenon known as the *negativity bias* (Baumeister et al., 2001), being highly mindful could also enhance one's ability to experience the rewards of positive events more fully. Indeed, a study of the effects of MBCT on day-to-day positive experience suggested that compared to baseline levels and compared to a control group, mindfulness training led to rating pleasant experiences as more positive and to experiencing more positive affect following pleasant experiences (i.e., more rewards from pleasant experiences; Geschwind et al., 2011). This aligns with findings linking mindfulness to positive affect and emotions in general (e.g., Brown & Ryan, 2003; Davidson et al., 2003) and with the broaden-and-build theoretical model that suggests that fostering mindfulness encourages an upward spiral of positive emotions and flourishing (Garland et al., 2010).

Consistent with the broaden-and-build theory, Catalino and Fredrickson (2011) found that "flourishers" (i.e., those with high emotional well-being and regular experiences of positive emotion) experience greater emotional "boosts" from pleasant experiences in their daily lives. That is, flourishers experience greater emotional reactivity to positive events. Furthermore, Catalino and Fredrickson found that greater reactivity to pleasant events was positively associated with dispositional mindfulness (particularly the observing and non-reactivity facets). Thus, mindfulness might predict greater emotional reactivity to pleasant events. This notion is akin to the concept of "savoring," through which individuals maximize benefits of positive life experiences through purposeful attention (Bryant & Veroff, 2007). Mindful savoring of pleasant experiences could potentially prompt upswings in positive emotion. Future research should further explore the role of mindfulness in emotional responses to specific positive experiences and how these differ from emotional responses to negative experiences.

The decentered perspective (i.e., a detachment from thoughts and emotions) fostered by mindfulness also appears to *dampen a number of negative self-conscious emotions and emotional responses* to self-concept threatening stimuli and

situations. For example, social rejection has a robust negative effect on individuals in laboratory studies (see Leary, Twenge, & Quinlivan, 2006, for a review). Heppner et al. (2008) explored the capacity for mindfulness to buffer aggressive reactions to social rejection. Sixty participants met in small groups to introduce themselves and to receive study instructions. Then, they were separated and wrote self-descriptive essays, which were ostensibly distributed to all other participants. Based on these essays, they voted for who they liked, respected, and wanted to work with on a later task. Participants were given (bogus) feedback about the voting to make them feel accepted or rejected by their fellow participants. Then, they were given the opportunity to play an aversive noise in the ears of their opponents in a competitive reaction time task. Short mindfulness instructions delivered just prior to receiving the rejection feedback predicted less aggressive behavior (shorter, less intense noise blast selections) in the competitive task (Heppner et al., 2008).

Similar to self-concept threats from others, as in the case of social rejection, a person's own reflections on negative behaviors he/she has performed can threaten self-concept. Individuals vary in the degree to which they can recall and discuss such negative events with awareness and without distortion (i.e., to make them appear less negative; Barrett, Williams, & Fong, 2002). Lakey, Kernis, Heppner, and Lance (2008) explored the role of mindfulness in such reflections on past negative behaviors. Participants answered a series of 25 questions that were progressively more personal and imposing (e.g., "Tell me about your most enjoyable experience," "Tell me about a time when you've done something unethical on an assignment" in the presence of trained interviewers. Their answers were later coded for verbal defensiveness, which is an assessment of the "traces left by defensive processes in the content and structure of speech" (Barrett et al., 2002, p. 777). They found that individuals who were highly mindful exhibited less verbal defensiveness when discussing past indiscretions. Along these same lines, as already discussed, Niemic et al. (2010)

demonstrated that the defensiveness typically triggered by thoughts of one's own death was attenuated among highly mindful individuals. Furthermore, Leary et al. (2007) demonstrated that high levels of self-compassion, of which mindfulness is a central component, predicted reduced emotional reactivity to negative events across a variety of contexts, including recalling and imagining negative events, reacting to ambivalent feedback, and experiencing day-to-day negative events.

Importantly, experience sampling methodologies reveal similar benefits for mindful emotion regulation over time. Experience sampling methodologies involve repeated assessments of the same construct within the context of the participants' current experiences. Thus, experience sampling methodologies allow for examination of moment-to-moment experience, as well as trends in experience over time (e.g., instability). Utilizing experience sampling with a sample of adults and a sample of introductory psychology students, Brown and Ryan (2003) investigated moment-to-moment links between trait mindfulness, state mindfulness (in the student sample), pleasant and unpleasant affect, and autonomous self-regulation. For 21 (in the adult sample) or 14 (in the student sample) days, participants were sent pager messages on a quasi-random schedule which signaled them to complete one paper and pencil form from a bound packet. In both samples, dispositional mindfulness predicted day-to-day autonomy and unpleasant affect (but not pleasant affect). Momentary or state mindfulness predicted greater autonomy and pleasant affect, and less negative affect, and these relationships held controlling for trait mindfulness. In a more recent study (Hill & Updegraff, 2012), undergraduate participants reported on their current emotional experience approximately six times a day for a week. Dispositional mindfulness predicted fewer self-reported emotion regulation difficulties, as well as greater emotion differentiation. Importantly, greater emotion differentiation (positive and negative) mediated the relationship between mindfulness and reduced emotional instability (positive and negative)

over the course of the week. In other words, *more mindful individuals evidenced lower volatility or lability in their emotions*. More research is needed examining the role of mindfulness in everyday experiences of emotion and ongoing emotion regulation in naturally occurring contexts.

Neurological Underpinnings of Mindful Emotion Regulation

While much of the data linking mindfulness to emotional experience has been obtained using self-report methodologies, a growing body of research points to the neurological underpinnings of mindful emotion regulation. Several studies point to reduced reactivity to emotional stimuli and illustrate the down-regulating role being mindful plays in such reactions by virtue of (de-) activations of consistent brain areas, and at least one study suggests that mindful emotion regulation occurs early in affective processing.

High levels of mindfulness are linked to *increased activation in the prefrontal cortex and decreased amygdala activation when processing emotional stimuli*. These patterns of brain activation are thought to reflect lower negative affect and enhanced emotion regulation. Creswell, Way, Eisenberger, and Lieberman (2007) demonstrated that high levels of trait mindfulness were associated with enhanced prefrontal cortex activation when labeling negative affective stimuli. Similarly, Modinos, Ormel, and Aleman (2010) linked high levels of mindfulness skills to increased dorsomedial prefrontal cortex activation, an area involved in reappraisal. This increased activation was inversely related to amygdala activation in response to negative stimuli.

Neural mechanisms of mindfulness appear to operate in stark contrast to indices of emotional dysregulation such as depressive symptomatology. In one study (Way, Creswell, Eisenberger, & Lieberman, 2010), highly mindful individuals showed less resting activation in self-referential processing areas and in the amygdala (bilaterally), while depressive symptoms were correlated with greater resting activation in these areas

(self-referential areas and the right amygdala). In addition to differences in resting activity, this same study showed less amygdala activation in response to emotional faces in highly mindful individuals, while depressive symptoms correlated positively with amygdala activation to emotional faces. Reduced resting activation largely accounted for the links between mindfulness and reduced activation in response to emotional stimuli.

Interestingly, the way mindfulness influences emotion regulation may differ as one becomes more experienced in being mindful. Taylor et al. (2011) compared the emotional responses of long-term meditators versus beginners. For both groups, positive and negative images were rated lower in emotional intensity when viewed in a mindful state compared to a baseline/normal state. Interestingly, the neural mechanisms underlying this were different for beginners versus experienced meditators. In beginners, viewing emotional images in a mindful state was related to down-regulation of the amygdala, while for experienced meditators, viewing emotional images was related to reduced activation in right medial prefrontal cortex and posterior cingulate cortex. This pattern suggests that higher-order cortical regions become less involved in emotion regulation in experienced meditators. In other words, when one is extensively trained in mindfulness, experiences of reduced emotional intensity may be explained by “accepting and fully experiencing emotional responses in the present moment without interference from internal thought and self-referent processes, as opposed to directly controlling low-order affective brain systems from higher-order cortical regions” (Taylor et al., 2011, p. 1531).

Mindfulness appears to be implicated in the process of emotion regulation versus reactivity in an early phase of emotional processing. Brown, Goodman, and Inzlicht (2012) investigated links between trait mindfulness and late positive potential (LPP) responses. LPPs are thought to index attention to emotional stimuli and to mark emotional arousal. Highly mindful individuals showed lower LPPs to highly arousing positive (erotica) and negative (corpses)

images. In this same study, neuroticism and negative affectivity (trait) were both linked to increased LPP responses to highly arousing negative images.

Mindful Emotion Regulation as a Mechanism of Behavioral Outcomes

As we have shown in this chapter, evidence is mounting that high levels of mindfulness are linked to more positive and less negative emotional states, as well as less variable emotional states. Furthermore, mindfulness appears to reduce reactivity to emotional stimuli and events. Thus, studies suggest that mindfulness plays a substantial role in effective emotion regulation.

The ways in which people regulate their emotions are thought to impact a number of behavioral outcomes. For example, a prominent model of addiction posits that the avoidance of negative affective states is a primary motive for drug use (Baker et al., 2004; Baker, Piper et al., 2004). Furthermore, nonacceptance of unpleasant emotions has been implicated in smoking and other substance use (Adams, Tull, & Gratz, 2012; Axelrod, Perepletchikova, Holtzman, & Sinha, 2011; Carmody, Vieten, & Astin, 2007). Emerging evidence links trait mindfulness and mindfulness training (which explicitly involve increased awareness and acceptance of emotions) to reductions in substance use and better cessation outcomes (e.g., Heppner et al., 2015; Witkiewitz & Marlatt, 2004; Chap. 14), for additional discussion of mindfulness and addiction). Therefore, more effective emotion regulation provides a theoretical mechanism for the effects of mindfulness on substance use and cessation outcomes. In this section we illustrate the mechanistic role of mindful emotion regulation for the self-regulation of behavior by reviewing evidence linking mindfulness to substance use disorders, including smoking, alcohol, and other drugs, and how emotion regulation mediates these relationships.

Substance abuse and dependence represent significant public health problems. Smoking is

responsible for an estimated 443,000 deaths a year (CDC, 2008) and is linked to approximately 30 % of all cancers (Mokdad, Marks, Stroup, & Gerberding, 2004) and 90 % of lung cancers (U.S. Department of Health and Human Services, 2004). Abuse of tobacco, alcohol, and other drugs costs our nation more than \$484 billion per year (ONDCP, 2001). Unfortunately, drug addiction is considered a chronic relapsing condition (Connors, Maisto, & Donovan, 1996) and relapse rates are high following treatment (McLellan, Lewis, O'Brien, & Kleber, 2000).

Mindfulness may assist in cessation from smoking, alcohol or other drugs. Enhanced attention to thoughts and feelings allows for the early identification of problematic thoughts and feelings, and promotes adaptive, flexible responding to these feelings (Roemer & Orsillo, 2003; Teasdale, Segal, & Williams, 1995) rather than automatized or reactive responses. Furthermore, observation, exposure, and openness to experience are core components of mindfulness (Baer et al., 2006; Bishop et al., 2004; Shapiro et al., 2006). In stark contrast to this notion, prominent models of addiction implicate the avoidance of negative affective states as a primary motive for drug use (Baker, Brandon, & Chassin, 2004; Baker, Piper et al., 2004). A highly mindful individual may be more aware and accepting of unpleasant sensations (e.g., negative affect, craving), and thus less likely to respond impulsively via substance use (Groves & Farmer, 1994).

Emerging evidence links trait mindfulness, brief mindfulness exercises, and more intensive mindfulness-based interventions to lower addiction and enhanced cessation. One study with smokers at the time of enrollment in a smoking cessation treatment program demonstrated that individuals high in trait mindfulness were less dependent on cigarettes and demonstrated less affective withdrawal severity and a greater sense of agency for their upcoming quit attempt (Vidrine et al., 2009). High levels of trait mindfulness have also been linked to less use of alcohol and alcohol-related problems in samples not dependent on alcohol (Fernandez, Wood, Stein, & Rossi, 2010; Smith et al., 2011).

In addition to evidence with trait mindfulness, more controlled studies link mindfulness exercises and training to lower substance use. An experimental investigation of a brief mindfulness exercise (body scan) with smokers demonstrated that compared to a control group, participants in the body scan condition reported significantly lower desire to smoke for up to 5 min after the intervention (May, Andrade, Willoughby, & Brown, 2011). In one randomized controlled pilot trial of mindfulness training for smoking cessation (Brewer et al., 2011), individuals in the eight-session mindfulness training group were more likely to be abstinent from smoking at a 17-week follow up when compared to a standard treatment control group (Freedom From Smoking). Similarly, Bowen et al. (2009) evaluated MBRP as an aftercare program for individuals who had completed intensive treatment for substance use disorders (alcohol and other drugs) and found that those in the MBRP group decreased drug use to a greater extent than those in treatment as usual at 2 months post intervention (although this effect had decayed by 4 months post intervention).

The burgeoning literature on mindfulness, addiction, and substance use also illustrates the

role of emotion regulation in cessation. Negative affect is consistently implicated in relapse to substance use (e.g., Baker, Piper et al., 2004; Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Hodgins, El-Guebaly, & Armstrong, 1995; Witkiewitz & Villarroel, 2009). Given the preponderance of evidence linking mindfulness to lower levels of negative affect, it follows that mindfulness may aid in cessation from smoking/substance use through its effects on emotion regulation. Figure 9.1 (adapted from Adams, Benitez et al., 2012; Adams, Cano et al., 2012) illustrates potential emotional pathways through which mindfulness may aid in cessation. First, mindfulness reduces negative affect, which aids cessation and reduces relapse. Second, mindfulness also appears to attenuate the link between negative affect and substance craving/use. Researchers (e.g., Adams, Benitez et al., 2012; Adams, Cano et al., 2012; Witkiewitz & Bowen, 2010) have described these as mediation and moderation pathways that may occur simultaneously. Evidence for each pathway is reviewed in turn below.

First, mindfulness may influence substance use and cessation by reducing negative affect. In a sample of smokers attempting to quit, individuals high in trait mindfulness were more likely to

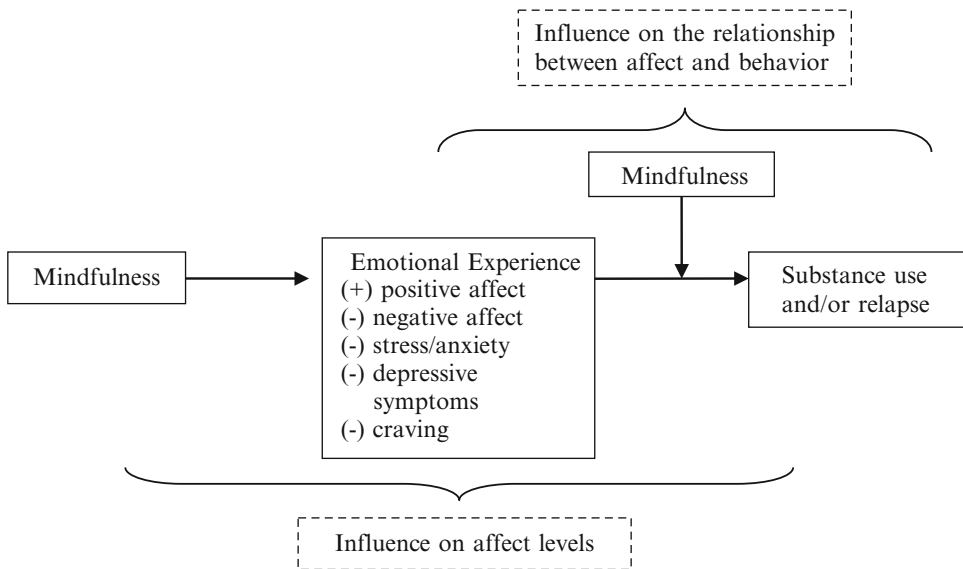


Fig. 9.1 Conceptual model of the role of mindfulness and emotion regulation in substance use and/or relapse

be abstinent over time, examined at follow-up time points of 3 days, 31 days, and 26 weeks post-quit (Heppner et al., 2013). For early smoking abstinence (i.e., 3 days post-quit), reduced negative affect—depressive symptoms, sadness, and anger—mediated the relation between mindfulness and early smoking abstinence. In other words, highly mindful individuals had lower levels of negative affect which translated into greater likelihood of smoking abstinence at day 3 of their quit attempt.

Other studies are consistent with the notion that mindfulness reduces negative affect and associated substance cravings and substance use. For example, May et al. (2011) found that a mindfulness exercise (the body scan) reduced irritability, tension, restlessness, and smoking urges. In another laboratory-based study, participants using both a suppression-based and a mindfulness-based strategy for coping with cigarette cravings showed reduced smoking at 7-day follow-up; however, only participants in the mindfulness condition also showed reductions in negative affect and depressive symptoms (Rogojanski, Vettese, & Antony, 2011). Thus, the mindfulness-based strategy appeared to target emotion regulation specifically whereas the (here, equally effective) suppression strategy did not operate via an emotional pathway. In a pilot study of an intensive mindfulness meditation-based intervention, “Mindfulness Training for Smokers,” results demonstrated that highly compliant meditators achieved 100 % abstinence at 6 weeks post-quit (Davis, Fleming, Bonus, & Baker, 2007). Highly compliant meditators also showed a concomitant decrease in perceived stress from baseline to 1-day post quit while moderately compliant meditators showed an increase after quitting. Similarly, symptoms of affective distress (e.g., depression, anxiety, and hostility) decreased more in the highly compliant group compared to the moderately compliant group from pre- to post-quit, although this difference was not significant in this small pilot study.

In addition to the effects of mindfulness on emotional experience, mindfulness may attenuate the link between unpleasant emotional states and substance craving/use. Negative affect often

leads to craving, and craving strongly predicts relapse to drug use (for example, cigarettes; Shiffman et al., 2002). Therefore, mindfulness may operate on substance use behaviors not only by mitigating negative affect itself, but also by weakening the link between emotional states, craving/urge, and drug use. Data from this moderation perspective includes studies with trait mindfulness, short mindfulness instructions, and mindfulness-based treatment programs.

Among a sample of smokers attempting to quit, high levels of trait mindfulness were linked to less perceived stress, as well as less problematic drinking, indexed by quantity of alcohol consumed, frequency of binge drinking, and likelihood of alcohol abuse/dependence (Adams, Cano et al., 2012). Moreover, trait mindfulness moderated the relationship between perceived stress and quantity of alcohol use such that higher perceived stress predicted increased alcohol use among participants low but not high in trait mindfulness. In a sample of college students, brief mindfulness instructions given in the lab reduced cigarettes smoked per day over the 7-day follow up, but had no effect on reports of negative affect or urge to smoke (Bowen & Marlatt, 2009). However, participants given the mindfulness instructions showed a weaker relationship between negative affect and urges to smoke than those in the control group. In another laboratory study brief mindfulness instructions attenuated the association between negative affect and smoking urges (Adams, Benitez et al., 2012). Whereas negative affect was strongly linked to increased smoking urges among female smokers in a control condition, negative affect was not related to smoking urges among participants who had just listened to 20 min of mindfulness instructions. A similar effect emerged in a randomized trial of MBRP for substance use (alcohol, cocaine/crack, and methamphetamines; Witkiewitz & Bowen, 2010). MBRP participants reduced substance use 4 months post-intervention. While craving mediated the relationship between negative affect and substance use in the treatment-as-usual group, in the MBRP group, the link between negative affect and craving was mitigated.

Research on other behavioral outcomes (e.g., eating) also demonstrates burgeoning evidence that mindfulness aids in the self-regulation of behaviors through its effects on emotion regulation. For example, mindfulness-based treatment programs have been applied to food cravings and eating disorders with some positive results (see Kristeller, Baer, & Quillian-Wolever, 2006, for a review) and aspects of trait mindfulness (Nonjudging and Acting with Awareness) have been linked to fewer eating disorder symptoms (Adams et al., 2012). Given that a central feature of overeating (especially binge eating) is disturbances in affect regulation (Kristeller et al., 2006), emotion regulation may be one mechanism by which mindfulness promotes healthier eating patterns. One study of DBT adapted for Bulimia Nervosa demonstrated significant reductions in binge eating and purging and concomitant reductions in negative affect and emotional eating, although the effects on affect were not significant in this small sample (Safer, Telch, & Agras, 2001). Another pilot study of a meditation-based intervention for binge-eating disorder yielded reductions in binge eating and binge eating severity along with reductions in depression and anxiety from pre- to post-treatment (Kristeller & Hallett, 1999). Although more research is needed, it is possible that mindfulness promotes more adaptive regulation of a variety of addictive behaviors (e.g., smoking, alcohol use, eating behavior) through its effects on emotion regulation.

Conclusions

Being mindful and increasing mindfulness clearly benefits emotion regulation. Emotions and our relationships to emotions are sufficiently important to the concept of mindfulness that multiple operational definitions of mindfulness implicate emotion regulation specifically. In addition, empirical evidence overwhelmingly links mindfulness to less negative and more positive affect. Our review of the extant literature revealed that mindfulness appears to aid in emotion regulation by one of several mechanisms

including (1) nonjudgmental awareness of negative states which results in increased willingness to experience negative emotions, (2) a reduced reactivity to emotional stimuli and situations, (3) a decentered perspective which dampens self-conscious emotions and self-esteem involvement, (4) an increased stability (i.e., reduced variability or volatility) in negative emotions over time, and (5) the activation (or deactivation) of consistent brain areas (e.g., amygdala) early in the time course of affective processing. Finally, the regulation of emotions is integral to the self-regulation of a number of important behaviors. The highlighted research linking mindfulness to substance use and cessation through its effects on emotion regulation demonstrates this important link. We hope research continues to explore the effects of mindfulness on health and behavior, and that research further clarifies the role of emotion regulation in these links. This avenue of future research will simultaneously refine our empirical notions of the construct of mindfulness and will inform interventions and treatment programs for other health and behavior outcomes.

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