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Mindfulness and its relationship to emotional regulation

Christina L. M. Hill

Eastern State Hospital, Williamsburg, VA

John A. Updegraff

Kent State University, Kent, OH

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Author note

Christina L. M. Hill and John A. Updegraff, Department of Psychology, Kent State University

Christina L. M. Hill is now in the Forensic Department, Eastern State Hospital

Correspondence concerning this article should be addressed to Christina L. M. Hill, Forensic Department, Eastern State Hospital, Williamsburg, VA. E-mail: christina.hill@dbhds.virginia.gov

Abstract

Research on the effectiveness and mechanisms of mindfulness training applied in psychotherapy is still in its infancy (Erisman & Roemer, 2010). For instance, little is known about the extent and processes through which mindfulness practice improves emotion regulation. This experience sampling study assessed the relationship between mindfulness, emotion differentiation, emotion lability, and emotional difficulties. Young adult participants reported their current emotional experiences six times per day during one week on a palm pilot device. Based on these reports of emotions, indices of emotional differentiation and emotion lability were composed for negative and positive emotions. Mindfulness was associated with greater emotion differentiation and less emotional difficulties (i.e., emotion lability, and self-reported emotion dysregulation). Meditational models indicated that the relationship between mindfulness and emotion lability was mediated by emotion differentiation. Furthermore, emotion regulation mediated the relationship between mindfulness and both negative emotion lability and positive emotion differentiation. This experience sampling study indicates that self-reported levels of mindfulness are related to higher levels of differentiation of one's discrete emotional experiences in a manner reflective of effective emotion regulation. (175 words)

Key words: mindfulness, emotional awareness, emotion lability, emotion regulation, experience sampling

Mindfulness and its relationship to emotion regulation

Mindfulness is a characteristic of mental states that emphasizes observing and attending to current experiences including inner experiences such as thoughts and emotions (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Bishop et al., 2004; Brown & Ryan, 2003; Germer, Siegel, & Fulton, 2005) with a non-judgmental attitude and with acceptance (Bishop et al., 2004). Recently developed psychotherapies have included components of mindfulness practice to partly improve emotional well-being (e.g., Dialectical Behavior Therapy, DBT, Linehan, 1993a; 1993b; Mindfulness-Based Stress Reduction, MBSR, Kabat-Zinn, 1990; Mindfulness-Based Cognitive Therapy, MBCT, Segal, Williams, & Teasdale, 2002; Acceptance and Commitment Therapy, ACT, Hayes, Strosahl, & Wilson, 1999). For example, DBT training was helpful in decreasing emotional distress as measured by less depression, anger, and anxiety in individuals with borderline tendencies (e.g., Bohus et al., 2004; Koons et al., 2001). MBCT was also helpful in reducing depression, and anxiety (Evans et al., 2008; Mathew, Whitford, Kenny, & Denson, 2010; Segal et al., 2002). Along with depression, anxiety, and anger, changes in negative and positive affect have also been observed as a result of MBCT training (e.g., Schroevers & Brandsma, 2010).

However, at this time, many aspects of the relationship between mindfulness and emotion regulation still need to be assessed. For instance, no study has looked at the direct association between mindfulness and emotion lability, or shifts between emotions (Harvey, Greenberg, & Serper, 1989), an emotional dysregulation often found in psychopathology such as bipolar and BPD (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009; Koenigsberg et al., 2002).

Psychological Constructivist Models of Emotion

Historically, emotions have been viewed as either basic inborn instincts, where emotions are physiological responses triggered by external events and lead to predictable patterns of activity in the brain and periphery (Allport, 1924; Ekman, 1972; Izard, 1971, Panksepp, 1998; Wilson-Mendenhall, Barrett, Simmons, & Barsalou, 2011), or as direct products of people's appraisals of external events in relation to needs, goals, or concerns (Arnold, 1960; Frijda, 1986; Lazarus, 1991; Wilson-Mendenhall et al., 2011). In these models, there is relatively little room for factors such as mindfulness to shape people's experience of emotion. In contrast, more recent psychological constructivist models of emotion, such as Barrett (2009)'s *conceptual act model*, posit that emotions are a range of variable mental events, composed of basic psychological ingredients (including biological factors, and meaning making from both external, and internal sensory or affective state). However, in the *conceptual act model*, categorization and labeling of subjective states are emphasized, in the sense that individuals label subjective experiences with words and internalize these experiences accordingly (Barrett, 2009). According to this model every moment we experience is composed of external events, internal sensations, and prior experiences that interact to form our mental states. Different weighing of each basic element composing experiences can help explain the variability observed in mental events such as perceptions, cognitions, and emotions (Barrett, 2009).

Barrett (2009) proposed multiple factors that may explain the variability observed in emotions more directly. One factor is individuals having various levels of emotional reactivity. Emotional lability represents one form of emotional reactivity (DSM-IV-TR, APA, 2000). If a person is reactive, he or she may put more emphasis on certain elements composing an experience such as past experiences while limiting access to the other factors like inner sensations, possibly leading to a skewed perception and labeling of the experience. Furthermore,

because of this concentration on limited aspects of the experience then labeling may occur faster for a person who is reactive versus someone who will pay attention to every piece of information composing the mental state.

Mindfulness and Emotion Lability

Taking a more mindful stance towards one's experiences and emotions may be helpful in enhancing emotion regulation by limiting reactivity (Linehan, Bohus, & Lynch, 2007), including emotional lability. As such, one characteristic that individuals who endorse mindfulness tendencies may have is less emotional lability. In fact, mindfulness tendencies or training have recently been associated with less emotional reactivity to external stressors (Arch & Craske, 2010) and repetitive thoughts (Feldman, Greeson, & Senville, 2010), less return to depressive thinking following sad mood induction (Kuyken et al., 2010), and brain processing associated with reduced reactivity (Van Den Hurk, Janssen, Giommi, Barendregt, & Gielen, 2010). Thus, we expect that higher levels of self-reported mindfulness should be related to lower levels of emotional lability, both for generalized positive and negative emotions, as well as for individual discrete emotions.

Researchers have operationalized emotion lability in a number of ways, including patterns of change from one type of emotion to another (Koenigsberg et al., 2002), shifts between positive and negative emotions (Ebner-Priemer, Kuo et al., 2007), changes from day to day, morning to evening (Cowdry, Gardner, O'Leary, Leibenluft, & Rubinow, 1991), time-contingent variability representing changes in emotion over time (Ebner-Priemer, Eid et al, 2009), and event-contingent variability (Ebner-Priemer, Eid et al., 2009). Although each of these methods looks at specific aspects of emotion lability, a frequently used method to assess emotional lability is the within-person standard deviation of emotions over time (Eaton &

Funder, 2001). People who have emotions that show great fluctuations in intensity across time have greater within-person standard deviations, whereas those who have relatively stable levels of emotions over time have smaller within-person standard deviations. Thus, the within-subject standard deviation is independent of actual levels of emotion and represents change in emotional intensity over a set period of time (Chow, Ram, Boker, Fujita, & Clore, 2005), and is well-suited to capture general fluctuations in emotional experience over time.

Mindfulness and Emotion Differentiation

The ability to discriminate or differentiate between discrete emotions has been related to effective emotion regulation (e.g., Barrett, Gross, Christensen, & Benvenuto, 2001; Larson, 2000; Paivio & Laurent, 2001; Tugade, Fredrickson, & Barrett, 2004). Greater emotion differentiation (Barrett et al., 2001) – or emotional granularity – (Tugade et al., 2004) is believed to be important because if a person can discriminate between his or her emotions, he or she would be more likely to notice specific information related to that emotion, such as its origin (Barrett et al., 2001; Tugade et al., 2004).

Mindfulness may then also be helpful in improving emotion regulation by increasing awareness (Erisman & Roemer, 2010), and more specifically emotional awareness of subtle differences between emotional experiences in the present moment. Emotional awareness has been previously noted as an essential characteristic for effective emotion regulation (e.g., Gratz & Roemer, 2004; Linehan, 1993a). Emotional awareness is defined by “the extent to which people are aware of emotions in both themselves and others” (Ciarrochi, Caputi, & Mayer, 2003, p. 1478). The idea that mindfulness may enhance awareness and especially emotional awareness is not new. In fact, it is well-known that Buddhist meditation is thought to improve emotional awareness and control by learning to focus one’s attention on aspects of emotional responses

(Goleman, 2003; Nielsen & Kaszniak, 2006). If this concept is valid, self-reported mindfulness should be related to forms of emotional awareness related to the present moment.

Self-reported mindfulness has shown to be associated with measures of awareness such as emotional intelligence, including clarity of emotion and the ability to label one's emotion (Baer, Smith, & Allen, 2004; Brown & Ryan, 2003) and negatively related to alexithymia, or a difficulty identifying feelings (Baer et al., 2004). Still, the relationship between mindfulness and the precise nature of the emotional awareness is not fully understood. A number of studies examining the relationship between mindfulness and emotional awareness have used self-report measures that assess subjective report of awareness. For example, Baer et al. (2004) measured emotional intelligence, a form of emotional awareness with the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) and a lack of awareness such as alexithymia, or a difficulty describing one's feelings with the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994). However, if an individual is not fully aware of how he or she feels, self-report measures may not necessarily reflect accurately one's level of emotional awareness. Furthermore, retrospective methods of self-report of emotion can introduce possible biases (Ebner-Priemer, Kuo et al., 2007; Tennen & Affleck, 2002; Tolpin, Gunthert, Cohen, & O'Neill, 2004; Zeigler-Hill & Abraham, 2006) or access other form of knowledge than current emotion experiences, such as semantic knowledge of emotion or the emotions one experiences in general (Robinson & Clore, 2002a, 2002b).

Furthermore, a more mindful stance towards one's experiences and emotions – and in particular, by viewing them as mental states that do not demand an immediate reaction – may limit the rapid association of a label to the mental states experienced until more aspects of the experience are noticed. In fact, another individual difference that Barrett (2009) indicated is

variations in attention capacity. This attention capacity may be diminished if a person has a tendency to react quickly to their subjective emotional states. As previously noted some individuals may put more emphasis or their attention on certain ingredients creating an emotional mental state (e.g., past experiences). They may therefore quickly label a mental state without taking into consideration all possible aspects of the emotional experience. This label may then not necessarily represent accurately the full emotional experience. It may also limit the variety of their experience. Rapid labeling based on a few aspects of the mental state (e.g., past experiences) could possibly lead to two slightly similar mental states to be labeled as the same state. Consequently, individuals may not accurately differentiate between emotional states effectively if their attention capacity is blunted because of reactivity.

Experience sampling is a method well-suited to assess current emotional experiences as they occur, including both awareness of present emotions as well as emotional lability over time (Ebner-Priemer, Kuo et al., 2007; Tennen & Affleck, 2002; Tolpin et al., 2004; Zeigler-Hill & Abraham, 2006). Assessing the ability to discriminate or differentiate between emotional experiences represents one way to assess being aware in the present moment. In fact, Paivio and Laurent (2001) believed that noticing inner experiences was likely to increase emotional awareness. If the state of mindfulness helps being more aware of all the factors involved in creating emotional mental state, self-reported mindfulness should also to be related to the ability to notice subtle differences between emotional experiences.

Emotion differentiation can be assessed by correlating the similarly-valenced ratings of emotions gathered in experience sampling assessments for current reports of emotions (Barrett et al, 2001; Tugade et al., 2004). This method indicates that lower levels of emotion differentiation between two affects would be represented, for example, by someone whose reports of anger and

depression always covary or correlate with each other, whereas reports of anger and depression that are relatively independent of each other, would show a higher degree of differentiation between these two affective states. Mindfulness-based treatment research provides support for the idea that being mindful would increase the ability to discriminate between emotional experiences. Following training with DBT, individuals diagnosed with BPD were more precise in describing their emotions as attested by the reports of fewer non-specific emotions (Ebner-Priemer, Welch et al., 2007). Being mindful may improve emotion regulation, and consequently emotion lability by being related to a greater ability to differentiate between emotional experiences. Emotion differentiation following Tugade et al.'s (2004) method of assessment has not yet been used to assess the nature of the relationship between mindfulness and emotional awareness, as described by noticing subtle differences between emotional states.

The Present Study

This experience sampling study aimed to explore the relationship between mindfulness, emotion differentiation, emotion lability, and emotion dysregulation. If individuals with mindfulness tendencies are less emotionally reactive then they should show less emotional lability. Furthermore, the more a person differentiates between discrete emotional states, the more effective he or she may be at regulating emotions. He or she would also be likely to show less emotional difficulties, such as emotional lability. Consequently, we hypothesized that higher scores on a mindfulness measure will be associated with higher levels of emotion differentiation (i.e., lower correlations among similarly-valenced affects). We also hypothesized that self-reported mindfulness would be associated with less negative, positive, and individual emotion lability.

We also examined possible mediators of the relationship between mindfulness and emotion lability. If emotion differentiation is a way through which mindfulness improves effective emotion regulation, then emotion differentiation should mediate the relationship between mindfulness and emotion lability.

However, mindfulness may not simply affect emotion lability through emotion differentiation. Other factors present in effective emotion regulation may also explain partly why mindfulness would be associated with less emotion lability. It is therefore possible that emotion regulation or dysregulation per se would mediate the relationship between self-reported mindfulness and emotional lability. Similarly, emotion regulation may affect emotion differentiation directly so that emotion regulation or dysregulation mediate the relationship between mindfulness and emotion differentiation.

Method

Participants

One hundred and three undergraduate students from a large Midwestern university were recruited for this study. Due to missing data, seven participants were removed, leaving a final sample composed of 70 females and 26 males. The sample included 80 participants who were Caucasian, 8 African American, 5 Asian, 2 Hispanic, 1 other. The age average of the sample was $M = 19.19$, with $SD = 2.21$. Each participant received credit for a psychology course contingent on their participation.

Procedure

This study included lab sessions with a week of experience sampling between the two sessions. During the initial session, all participants provided informed consent and completed

the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). For the experience sampling part of the study, each participant received a Palm Pilot device, an instrument that was used with a program (The Purdue Momentary Assessment Tool, PMAT; Weiss, Beal, Lucy, & MacDermid, 2004) to record current experience for a week. Palm pilots were set up during the initial session with the participants' preferred onset time for each day. Participants recorded their emotions at a random beep scheduled approximately every 2 hours and for a total of 6 beeps throughout each day of the week following the initial session. The signal of the palm pilot lasted up to 60 seconds. Participants were to initiate answering the questionnaires during these 60 seconds. If participant did not initiate answering the questionnaires during the 60 seconds window period, this assessment was considered missing data. He or she would then have to resume at the following beep to report the current emotional state they experienced in that moment. The palm pilot compiled a log of recorded times at each signal and their responses that were non-accessible to participants. During the second lab session, participants brought back the palm pilot devices and completed the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004).

Questionnaire Measures

Five Facet Mindfulness Questionnaire. The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is a self-report measure assessing a general tendency to be mindful. This scale is composed of 39 items that are divided into 5 subscales or facets: non-reactivity, observing, acting with awareness, describing/labeling, and non-judging of experience. The non-reactivity subscale includes items such as "I perceive my feelings and emotions without having to react to them" ($\alpha = .80$). The observing facet is observing, noticing, attending to sensations/perceptions/thoughts/feelings which is composed of items such as "when I'm

walking, I deliberately notice the sensations of my body moving” ($\alpha = .81$). The acting with awareness facet is acting with awareness/automatic pilot/concentration/non-distraction and it includes items such as “I rush through activities without being really attentive to them” ($\alpha = .88$). The describing/labeling with words facet includes items such as “I’m good at finding the words to describe my feelings” ($\alpha = .87$). The non-judging of experience facet includes items such as “I disapprove of myself when I have irrational ideas” ($\alpha = .92$). The subscales include 8 items except the non-reactivity scale, which is composed of 7 items. Each subscale is a Likert scale ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). Cronbach’s α coefficient for the current sample was .88 for the full scale.

Difficulties in Emotion Regulation Scale. The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a self-report measure assessing clinical difficulties in emotion regulation. Higher scores on the scale indicate greater emotional dysregulation. The scale is composed of 36 items divided in six subscales: non-acceptance, goals, impulse, awareness, strategies, and clarity. The non-acceptance subscale is composed of six items that includes “when I’m upset, I feel guilty for feeling that way.” The goals subscale is composed of five items such as “when I’m upset, I have difficulty concentrating. The impulse subscale is composed of six items such as “when I’m upset, I lose control over my behaviors.” The awareness subscale includes six items such as “I am attentive to my feelings.” The strategies subscale is composed of eight items such as “when I am upset, I believe that I’ll end up feeling very depressed.” The clarity subscale includes five items such as “I have difficulty making sense out of my feelings.” Participants report how often the items apply to them on a 5-point-Likert scale ranging from 1 (*Almost never*) to 5 (*Almost always*). The DERS scale has been validated against other related measures of emotion regulation (Gratz & Roemer, 2004), and is known to be related to specific

forms of emotion dysregulation (e.g., frequency of self-harm; frequency of abuse of intimate partner for males), (Gratz & Roemer, 2004). Cronbach's α was .92 for the current sample.

Current emotional experiences. Participants reported their current subjective emotions on a Palm Pilot by answering "how do you feel right now?" Twenty-one emotions were selected for this study. Participants rated these emotions on a 7-point-Likert scale ranging from 1 (*not at all*) to 7 (*a great deal*). Emotions varied on the dimension of pleasantness-unpleasantness and were representative of both high and low activation emotions. The positive emotions included interested, happy, content, peaceful, calm, overjoyed, fascinated, curious, comfortable and proud. The negative emotions were sad, angry, ashamed, nervous, irritated, enraged, depressed, miserable, fearful, afraid, and guilty. Cronbach's α for mean of negative and positive emotions were .89 and .90, respectively.

Compliance. Compliance rate was calculated by dividing each participant's responses on the palm pilot by the total number of possible responses.

Analyses

Construction of emotional differentiation index. These indices were constructed using current emotion ratings gathered from the experience sampling part of the study. According to Barrett et al. (2001) higher correlations between similarly-valenced emotions reflect lower differentiation, whereas low correlations among similarly-valenced emotions are indicative of high differentiation between emotions. Indices of emotion differentiation were calculated based on Tugade et al.'s (2004) method, using intraclass correlations with current negative and positive current emotion ratings. The range of values for these indices is 0 to 1 with 0 indicating high differentiation (i.e., no correlation between ratings of similarly-valenced emotions) whereas values closer to 1 indicate low emotion differentiation.

Construction of emotional lability index. These indices were constructed using mean score within-subject standard deviations derived from each current emotion rating assessed during experience sampling. This method has previously been used and is commonly used as a measure of emotional instability (Eaton & funder, 2001; Jahng, Wood, & Trull, 2008). Each negative emotion's standard deviation across all emotion assessments of a participant was calculated, and averaged across the eleven negative emotions for the index of negative emotion lability. The standard deviations of the ten positive emotions were also averaged in a similar manner to compose an index of positive emotion lability. Higher scores on these indices reflect the higher levels of emotional lability and lower scores less emotional lability. Cronbach's α for standard deviation of negative and positive emotions were .91 and .89, respectively.

Construction of emotional lability for each individual emotions index. The standard deviation score for each individual emotion (such as anger or happiness) were used to construct individual emotional lability index. Again, higher scores reflect higher levels of emotional lability.

Results

Descriptive Statistics

Square root transformations were performed on the measures emotion differentiation as these variables showed a positive skewness. Descriptives of the variables are included in Table 1. The covariate variables of age, gender, ethnicity, and compliance were assessed. The compliance rate was $M = .54$ ($SD = .19$). Female participants had a greater compliance rate than male participants, $t(94) = 2.06$, $p = .04$. However, no covariate variable predicted the measures assessed in a predictable manner and were therefore not included in subsequent analysis (Table

2). Furthermore, weighting analyses by levels of compliance did not affect findings reported below.

Mindfulness and Emotion Lability

As predicted, self-reported mindfulness was negatively correlated with negative emotion lability, $r(96) = -.38, p \leq .05$. Follow-up regression analyses identified the non-reactivity subscale as significantly predicting negative emotion lability ($\beta = -.29, p < .01$), with a marginal contribution of the non-judging subscale ($\beta = -.19, p = .08$).

As predicted, self-reported mindfulness was also negatively correlated with positive emotion lability $r(96) = -.26, p \leq .05$, indicating less lability in emotional experiences co-occurring with greater reports of mindfulness. Follow-up regression analyses again identified non-reactivity subscale as significantly predicting positive emotion lability ($\beta = -.28, p = .01$), with marginal contributions by the subscales of non-judging ($\beta = -.21, p = .07$) and describing ($\beta = .19, p = .07$). Pearson correlations were performed to assess the relationship between mindfulness and each individual index of emotion lability. Self-reported mindfulness was negatively associated with lability of all individual emotions, with the exception of irritated, fascinated, and overjoyed (See Table 3).

Mindfulness and Emotion Differentiation

The relationship between mindfulness and the indices of negative emotion differentiation was tested with Pearson correlations. A greater tendency towards self-reported mindfulness was negatively associated with the index of negative emotion differentiation $r(96) = -.22, p = .03$, so that higher levels of mindfulness were related to greater negative emotion differentiation. A follow-up analysis regressed negative emotion differentiation onto the five mindfulness

subscales to identify the aspects of mindfulness most strongly related to negative emotion lability. Only the non-reactivity subscale approached significance ($\beta = -.19, p = .11$), with greater non-reactivity associated with greater negative emotion differentiation. All other facets of mindfulness were not significantly (p 's $>.32$), associated with negative emotion differentiation.

Similarly, higher levels of self-reported mindfulness were also related to greater positive emotion differentiation $r(96) = -.23, p = .02$. Follow-up regression analysis also identified non-reactivity as the mindfulness subscale that significantly predicted positive emotion differentiation ($\beta = -.32, p < .01$).

Mindfulness and Emotion Regulation

Self-reported mindfulness was also related to fewer emotion regulation difficulties ($r = -.58, p < .001$). Follow-up regression analysis identified several subscales of mindfulness that predicted emotion regulation difficulties, specifically: non-reactivity ($\beta = -.36, p < .001$), describing ($\beta = -.36, p < .001$) and non-judging ($\beta = -.25, p < .01$).

Mediators of Relationship between Mindfulness and Emotion Lability

We hypothesized that both greater emotion differentiation and fewer emotion regulation difficulties would be processes by which mindfulness would relate to less emotion lability. To test these meditational models, we used the Sobel product-of-coefficients test to test the significance of the hypothesized meditational pathways.

Emotion differentiation as a mediator. The first models we tested examined positive [negative] emotion differentiation as a mediator of the relationship between self-reported mindfulness and positive [negative] emotion lability. Both of these meditational models supported hypotheses. Negative emotion differentiation was a significant mediator of the relationship between self-reported mindfulness and negative emotional lability (Sobel $z = -2.08$,

$p < .05$) (see Figure 1). Because the non-reactivity was the aspect of mindfulness most strongly predictive of both negative emotion differentiation and lability, we also examined whether negative emotion differentiation mediated the relationship between non-reactivity and negative emotion lability. Indeed, it did ($z = -2.31, p < .05$).

Positive emotion differentiation was also a significant mediator of the relationship between self-reported mindfulness and positive emotional lability ($z = -2.10, p < .05$) (see Figure 1), as well as a significant mediator of the relationship between the non-reactivity subscale of mindfulness and positive emotional lability ($z = -2.57, p = .01$)

Emotion regulation as a mediator. We also tested whether self-reported emotion regulation difficulties mediated the relationship between self-reported mindfulness and (a) emotion differentiation and (b) emotion lability. Indeed, emotion regulation difficulties significantly mediated the relationship between self-reported mindfulness and positive emotion differentiation ($z = -3.28, p = .001$), as well as marginally mediated the relationship between self-reported mindfulness and negative emotion differentiation ($z = -1.82, p = .068$) (see Figure 2).

Last, we tested whether self-reported emotion regulation difficulties mediated the relationship between mindfulness and emotional lability. While emotion regulation did not mediate the relationship between self-reported mindfulness and positive emotion lability ($z = -.40, ns$), it did mediate the relationship between self-reported mindfulness and negative emotion lability ($z = -3.29, p = .001$) (see Figure 3). Thus, on the whole, analyses support our predictions that mindfulness influences emotional lability via its influence on emotion regulation and emotion differentiation.

Discussion

Summary of Findings

The present study sheds light on the relationship between self-reported levels of mindfulness and aspects of emotional processes. As a whole, the findings support the hypotheses that self-reported mindfulness is related to effective emotion regulation. Self-reported levels of mindfulness were related to lower levels of emotional reactivity as assessed by less emotion lability for both negative and positive emotions. Mindfulness ratings were also negatively related (or trended towards significance) to various individual emotion labilities such as anger, sad, afraid, ashamed, depressed, enraged, fearful, guilty, miserable, nervous, calm, comfortable, content, curious, interested, happy, peaceful, and proud. Mindfulness was also related to less reports of emotion dysregulation in general. Mindfulness also showed a relationship with emotional awareness as measured by the ability to describe subtle differences between discrete emotions. Higher levels of mindfulness were related to higher levels of emotion differentiation for both negative and positive emotions.

As a whole, results from the mediational models are consistent with the proposition that mindfulness reduces emotion lability by increasing emotion differentiation and improving emotion regulation. However, mindfulness may affect emotion regulation through other factors present in emotion regulation as well. In fact, emotion regulation mediated the relationship between self-reported mindfulness and negative (trend) and positive emotion differentiation. Emotion regulation difficulties also mediated the relationship between self-reported mindfulness and negative emotion lability, but not positive emotion lability.

The present study provides evidence supporting the relationship between mindfulness and effective emotion regulation. Mindfulness traits or training have previously been related to factors associated with less emotional reactivity (Arch & Craske, 2010; Feldman et al., 2010; Kuyken et al., 2010; Van Den Hurk et al., 2010). The present study provides clear evidence for

the link between self-reported mindfulness and less emotion lability in general, as well as less lability of most discrete positive and negative emotions.

Our findings may have some implications for understanding emotional difficulties in disorders such as BPD. Emotion lability is often the emotional pattern observed in individuals with BPD (DSM-IV-TR, APA, 2000). It appears that the more mindful a person is the less variability is observed in various positive and negative emotions over time. DBT training assessing individuals who often experience emotional lability (i.e., BPD) have also been helpful in decreasing emotional difficulty (i.e., depression, anxiety, and anger) (Bohus et al., 2004; Linehan, Armstrong, Suarez, Allmon, & Heard, 1991; Linehan et al., 2006). However, to our knowledge, no study has yet assessed the relationship between mindfulness and emotion lability directly.

A common factor among the effective treatments used for individuals with a diagnosis of BPD is learning to label discrete emotions (Gratz & Gunderson, 2006; Linehan, 1993a; 1993b). Having difficulty differentiating between emotional experiences is also a deficit in individuals diagnosed with BPD (Ebner-Priemer, Welch et al., 2007; Levine, Marziali, & Hood, 1997; Linehan, 1993a; Wolff, Stiglmayr, Bretz, Lammers, & Auckenthaler, 2007). The present study indicates that emotion differentiation may play a role in effective emotion regulation. In fact, self-reported mindfulness was related to greater emotion differentiation for both positive and negative emotional experiences and emotion differentiation mediated the relationship between self-reported mindfulness and emotion lability. A tendency to differentiate between emotional experiences has theoretically been associated to effective emotion regulation (Larsen, 2000; Paivio & Laurent, 2001) and previously found to correlate with effective emotion regulation tendencies as well (Barrett et al., 2001; Tugade et al., 2004).

Interestingly, the non-reactivity subscale of mindfulness was the aspect most strongly associated with both emotion lability and differentiation. By being less reactive towards one's experiences and emotional states, a person may be more inclined to pay attention to aspects of the emotional experiences. If a person is more inclined to notice emotional experiences instead of reacting immediately to them then the paradoxical effect of increasing the experience of emotion related to avoidant tendency (Follette, Palm, & Rasmussen Hall, 2004; Salkovskis & Campbell, 1994; Wegner, Erber, & Zanakos, 1993) would likely decrease. As such, less negative emotion reactivity should be observed, which would likely explain partly why higher levels of mindfulness were related to lower levels of emotion lability in the present study.

Furthermore, when considering Barrett's (2009) conceptual act model, by taking a less reactive stance towards one's experiences and emotional states, the person may hold off on adding a label and categorizing the experience and simply experience and notice more aspects of the mental events fully. By observing all aspects of a mental state, then understanding differences between experiences may increasingly develop, increasing awareness. In fact, if a person is reactive, that person may quickly rely on limited aspects of the emotional experience (e.g., prior knowledge), and less on other aspects such as inner sensations. The new experience may then represent, to some extent, a simplification of the actual experience. This inaccurate new experience once categorized would then be stored with other previous experiences, possibly biased experiences as well. On the other hand, when a person reports mindfulness tendencies, he or she would more likely reports the ability to notice the experience of the present moment fully, instead of relying simply on limited aspects of the experience (e.g., past experiences). As such, previously biased perceptions based on stored knowledge, inner or external sensations may also change the more a person is mindful. Individuals who were reactive may learn to be more in

tuned with all aspects of the experiences before labeling an emotion. They may then more accurately label their emotions, and possibly limit their reactivity further which would then be observed in their experience of emotions (i.e., less lability). This present study was the first to assess the relationship between self-reported mindfulness and emotional awareness as measured through emotion differentiation following Tugade et al. (2004) and Barrett et al.'s (2001) method, providing further support for mindfulness being related to increased emotional awareness of the present moment.

Emotion differentiation may not be the only way that mindfulness could possibly affect emotion lability. Analyses suggest that emotion regulation difficulties may also explain the relationship between mindfulness and negative emotion lability. However, other factors involved in effective emotion regulation may also explain these findings. For example, Barrett (2009) indicated that individual differences in controlled attention could explain variation in the ability to notice nuances between basic elements of emotional experiences.

Limitations

A number of individual difference measures (e.g., mindfulness, emotion regulation) were assessed via self-report, and analyses are correlational. Therefore, causation cannot be inferred. Furthermore, participants were generally healthy young adults, so it would be important to replicate findings with both a more general as well as clinical populations. In addition, the participants were not previously screened for mindfulness practice or beliefs. An important avenue for future research would be to examine how mindfulness practice might improve emotion differentiation as well as reduce emotion lability more specifically.

To our knowledge, assessing the ability to differentiate between emotional experiences with Tugade et al.'s (2004) methodology was not previously used in relation to mindfulness. In

future research, such methods may be applied to participants with more mindfulness practices and varied ages and backgrounds. Similarly, even though the relationship between mindfulness and emotion lability was conducted with young adults, the present findings indicate that studying emotion lability following mindfulness-based treatment may be helpful. In addition, the use of an experience sampling approach is a useful way of assessing emotion ratings in the present moment. Unlike lab studies, this method has the benefit of capturing emotions in everyday life as they occur multiple times a day. Because as Larsen (2000) stated emotion lability is a dynamic process and should be observed over time, an experience sampling approach is more likely to reflect change in emotions and provide a more accurate report of emotional experiences.

Conclusion

These findings suggest that mindfulness may improve emotion regulation by influencing people's awareness of their emotional experiences. Replications with individuals who practice mindfulness would therefore be important. Some individuals, such as individuals with BPD report difficulties being emotional aware even on self-report measures of awareness (e.g., Levine et al., 1997). Determining the specific deficits of these individuals may help focus the teachings of mindfulness-based treatments. In addition, assessing the effectiveness of mindfulness-based psychological treatments (e.g., DBT) by examining changes in the variables of emotion differentiation could provide insight to the mechanisms through which such treatment would likely be effective in improving emotion regulation. Understanding the etiology of emotions and how mindfulness may affect emotional development is also likely to provide insight into effective emotion regulation. The conceptual act model provides many avenues to understand how mental states are created, including the development of emotion lability.

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Table 1

Means, standard deviations, and range of variables and covariates

	M	SD	Range
Mindfulness	126.04	19.35	74-171
Emotion dysregulation	77.84	20	42-128
NE lability	.79	.44	.11-1.87
PE lability	1.37	.38	.39-2.23
NE differentiation	.20	.18	0-.94
(sqrt transformation)	.40	.2	0-.97
PE differentiation	.19	.16	.00-.76
(sqrt transformation)	.40	.17	.03-.87
Age	19.19	2.21	15-32
Compliance	.54	.19	.10-.90
Gender (Female)	70 (73%)	Gender (Male)	26 (27%)
Ethnicity (Caucasian)	80 (83%)	Ethnicity (Other)	16 (17%)

Note: NE = negative emotion; PE = positive emotion; sqrt = square root; M = mean;

SD = standard deviation.

Table 2

Correlations and t-tests of variables and covariates

	Mindfulness	NE lability	PE Lability	NE differentiation	PE differentiation	Emotion dysregulation
Age	.24**	-.06	-.17	.00	-.05	-.11
Compliance ^a	.09	-.08	-.12	-.03	-.13	-.21**
Gender ^b	.07	-.51	-.43	.16	-1.26	-.52
Ethnicity ^c	1.04	-.50	.33	-.47	.83	.47

Note: NE = negative emotion; PE = positive emotion

^aFemale participants showed greater compliance rate than male participants, $t(94) = 2.06$, $p = .04$; ^bGender was coded so that Female = 0 and Male = 1; ^cEthnicity was coded so that Caucasian = 1 and Others = 0. For Gender and ethnicity t-values were reported.

** $p \leq .05$

Table 3

Correlations between mindfulness and the standard deviation of each individual emotion

	Mindfulness		Mindfulness
Anger	-.35**	Fascinated	-.08
Sad	-.27**	Calm	-.21**
Irritated	-.13	Comfortable	-.32**
Afraid	-.18*	Content	-.26**
Ashamed	-.39**	Curious	-.16*
Depressed	-.32**	Interested	-.16*
Enraged	-.30**	Happy	-.26**
Fearful	-.31**	Peaceful	-.22**
Guilty	-.26**	Proud	-.17*
Miserable	-.35**	Overjoyed	-.09
Nervous	-.16*		

Note: * $p \leq .1$; ** $p \leq .05$

Figure 1

Relationship between mindfulness and emotional lability is mediated by emotion differentiation.

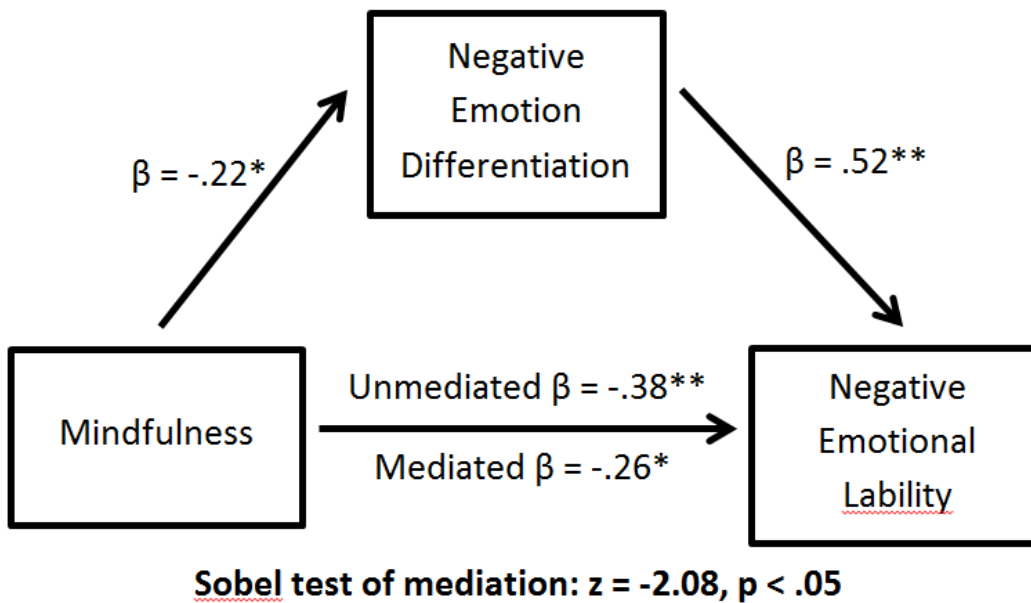
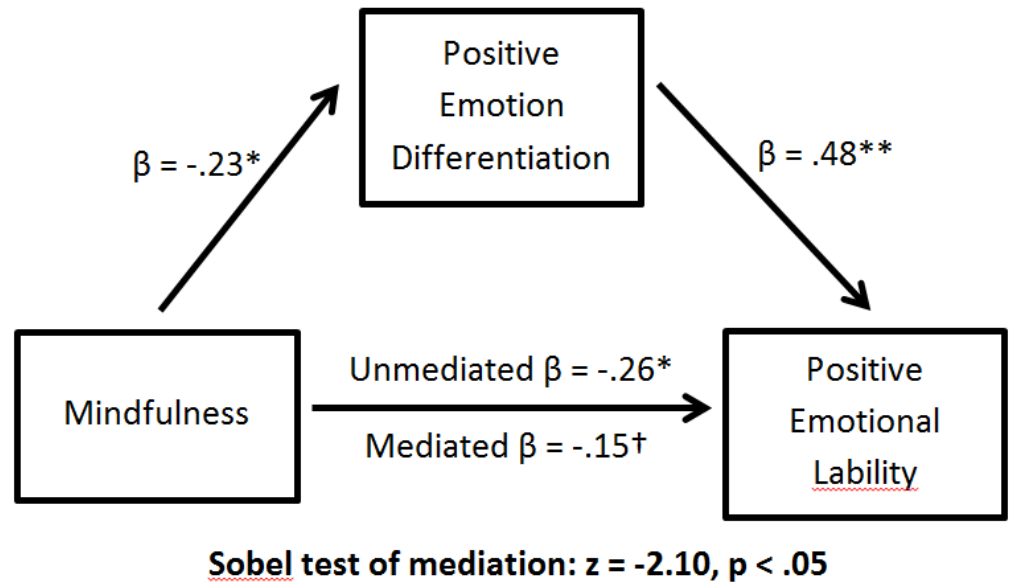


Figure 2

Relationship between mindfulness and emotion differentiation is mediated by emotion regulation difficulties.

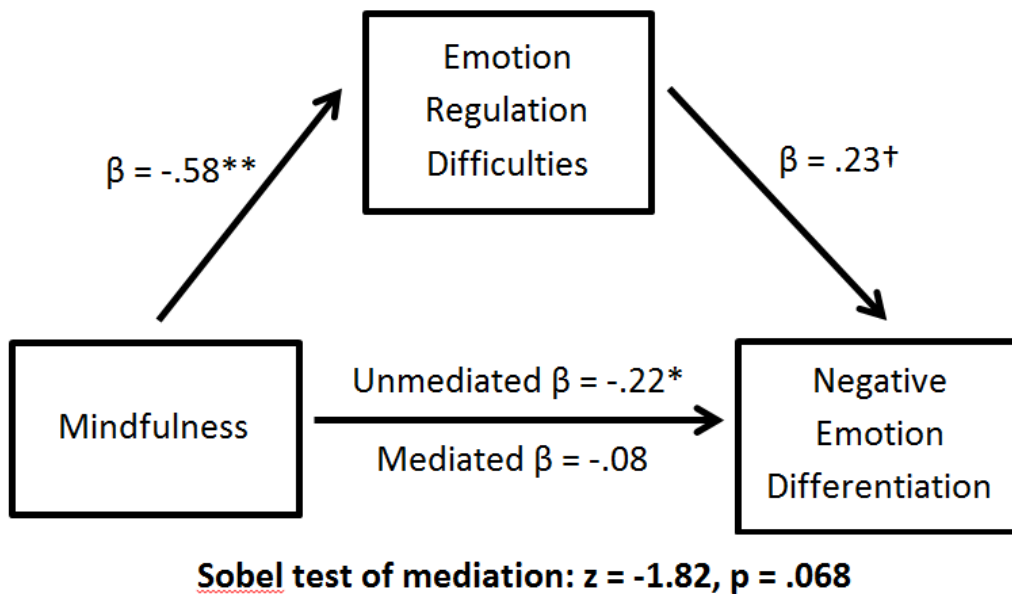
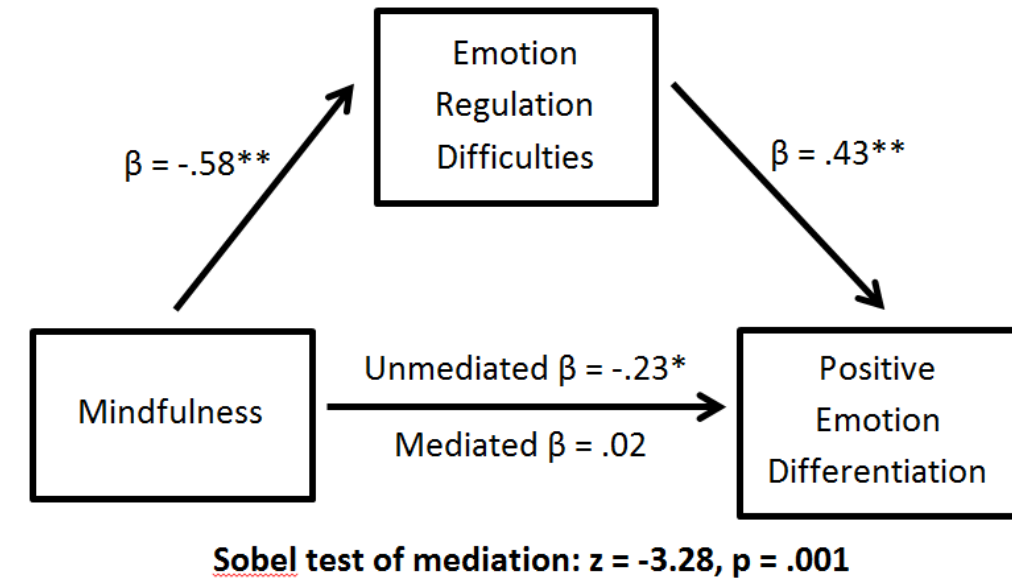


Figure 3

Relationship between mindfulness and negative emotional lability is mediated by emotion regulation difficulties.

