Burning Issues in Dispositional Mindfulness Research

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Authors’ Note

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Abstract

The recent development of dispositional mindfulness measures has sparked several contentious issues regarding our understanding of mindfulness, its measurement, and its development. In this chapter we consider theory and review empirical research to address four burning issues in dispositional mindfulness research. We review both scholarly and empirical research bearing on the meaning of mindfulness, and discuss distinctions between mindfulness and other attention constructs. We review the validity of dispositional mindfulness measures and highlight their convergence with mindfulness inductions and interventions on key outcomes of interest, namely psychological well-being and emotion regulation. We also attempt to show how the widespread deployment of psychometric instruments to measure individual differences in mindfulness has contributed to understanding how mindfulness itself -- apart from the methods designed to enhance it -- is related to adaptive emotion-relevant outcomes at neural, psychophysiological, and psychological levels of analysis. Finally, we discuss how qualities of mindful attention may develop through developmental and contextual influences, in addition to formal training. Investigating mindfulness as an individual difference has contributed to a developing theory of mindfulness, and has opened the field to topics of inquiry not easily permissible by other means.
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**Burning Issues in Dispositional Mindfulness Research**

The deliberate exercise of mindful attention has been practiced for 2500 years as a way to contact with, and gain insight into, ongoing events and experiences. In comparison, the application of modern scientific methods to the study of mindfulness is recent, but to date this work has revealed manifold benefits of mindfulness training and practice. In the last ten years, the development and increasingly widespread use of psychometric instruments to assess individual differences in mindfulness have resulted in numerous benefits to our empirical understanding of the construct. Likewise, emerging descriptions and operationalization of mindfulness have contributed to understanding the construct, revealing how mindfulness itself – apart from the training programs designed to enhance it – is related to numerous adaptive outcomes at neurobiological, psychological, and behavioral levels, and for a variety of normative and clinical populations. Despite this progress, the use of psychometric instruments to measure mindfulness has sparked a number of contentious issues regarding our understanding of the construct, its measurement, and its development. In this chapter, we consider theory and review empirical research to address four burning issues sparked by the recent interest in dispositional mindfulness:

1. How is mindfulness best defined and measured?
2. Are dispositional mindfulness measures dissociable from other measures of attention?
3. Are measures of dispositional mindfulness valid predictors of theoretically important regulatory outcomes?
4. How does mindfulness develop?

**How is Mindfulness Best Defined and Measured?**
Proposed definitions of mindfulness in the scientific literature span a wide range, sharing both commonalities and marked differences. Most writers and researchers trace their use of the term mindfulness to Buddhist psychology. Thus, establishing consensus on a definition of mindfulness and its lived expression may begin with a study of Buddhist scholarship. Such scholarship is built on a deep familiarity with Buddhist source texts, and the navigation of difficulties stemming from translational and cultural differences that have accrued over centuries. An inspection of this literature reveals a range of interpretations of the meaning of mindfulness. Scholar Georges Dreyfus (2011) notes that “Buddhism is a plural tradition that has evolved over centuries to include a large variety of views about mindfulness” (p. 42). Thus it is important to emphasize that there is no single, authoritative definition of mindfulness (Anālayo, 2013).

Limitations of space and expertise will not permit a discussion of the various understandings of mindfulness. For the present purposes we simply offer a brief look at two approaches to understanding mindfulness – the classical or canonical accounts, and the science-based accounts, as both have informed mindfulness operationalizations for research purposes. Scholarly accounts of classical mindfulness are based on the Pali Canon, the oldest surviving, complete collection of Buddhist texts. These texts offer rich descriptions of mindfulness that have informed subsequent interpretations and are still widely used today.

Even within this approach are layered meanings of mindfulness, and here we note just a few concise, contemporary descriptions of basic mindfulness from well-regarded scholars:

- “…an alert but receptive equanimous observation.” (Anālayo, 2003, p. 60)
- “…watchfulness, the lucid awareness of each event that presents itself on the successive occasions of experience.” (Bodhi, 2011, p. 21)
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- “The mind’s ability to keep the object in the ken [focus] of attention without losing it.” (Dreyfus, 2011, p. 47)

- “A kind of lucid holding of attention on an object, where the mind is both aware of the object and, in some sense, aware that it is aware of the object.” (Gethin, in press, p. 29)

These descriptions highlight a sustained attentiveness to, or awareness of perceptual events as they appear. The reference to attention in some texts and awareness in others may stem from the fact that outside of cognitive science, the terms are sometimes used interchangeably (e.g., Merikle & Joordens, 1997). Some scholars have used both to describe mindfulness (e.g., Bodhi, 2006; 2011), and in fact, both terms may be applicable, for two reasons. First, there is a close interrelation between attention and awareness in daily life (e.g., Lamme, 2003); second, and more specifically, an integration of attention and meta-awareness helps to distinguish mindfulness from related states. For example, attention may be concentrated, but only when coupled with meta-awareness – an apprehension of the current state of the mind that serves to monitor that focused attentiveness – does it become mindful (Dreyfus, 2011).

Quality of attention and/or awareness is also central to contemporary scientific definitions of mindfulness, as the well-known definition by Kabat-Zinn (1994, p. 4) illustrates: “Paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally.” The role of non-judgment or acceptance in mindfulness represents a major point of difference between classical and some scientific conceptions of mindfulness. Classical mindfulness, as interpreted by Bodhi (e.g., 2011) and others, gives judgment or evaluation a key place in the practice of mindfulness. Evaluation here concerns discrimination, a reflective consideration of what is healthy and unhealthy, wise or unwise action, that comes with the conjoining of sustained attentiveness and comprehension. Bodhi (2011, p. 26) makes the role of evaluation...
clear: “...the practitioner of mindfulness must at times evaluate mental qualities and intended deeds, make judgments about them, and engage in purposeful action.” In this way, classical mindfulness is value-laden, bringing to bear capacities of attention and discernment to regulate mental states and behavior. It is the area of evaluation that represents one major difference between classical and a number of science-based, and particularly clinical conceptualizations of mindfulness.

Distinctions between classical Buddhist and science-based conceptions of mindfulness also provide a helpful lens to better understand differences between the various operationalizations of mindfulness. Like both major approaches to conceptualizing mindfulness discussed here, the various self-report scale operationalizations of mindfulness highlight quality of attention, either as the central feature (e.g., Mindful Attention Awareness Scale; MAAS; Brown & Ryan, 2003), or among a set of factors (e.g., Five Facet Mindfulness Questionnaire; FFMQ; Baer, Smith, Hopkins, Krietemeyer & Toney, 2006). Beyond the attention factor, however, the various scales differ widely in their inclusion of other factors (e.g., describing, nonjudgment). The presence of these other factors has been strongly influenced by clinical perspectives on mindfulness. For example, the FFMQ and its ancestor, the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004) have their conceptual origin in Dialectical Behavior Therapy (Linehan, 1992). The Philadelphia Mindfulness Scale (Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) has its conceptual origins in Kabat-Zinn’s (1994) definition. Quaglia et al. (in press) discuss the conceptual origins of the extant mindfulness scales in further detail.

Going forward, it is important that researchers clearly state the conceptual provenance of each mindfulness measure used in research. This will help to convey the particular understanding
of mindfulness that is being examined and how that operationalized perspective on mindfulness is associated with the outcomes assessed. Addressing issues concerning the definition and operationalization of mindfulness will also benefit from scholarship and research to isolate the specific cognitive and other psychological processes involved in mindfulness (e.g., Davis & Thompson, in press). In this and others ways there is considerable opportunity for interchange between Buddhist scholarship and Western science in seeking shared, empirically grounded understandings of mindfulness.

**Are Dispositional Mindfulness Measures Dissociable from Other Measures of Attention?**

If mindfulness is fundamentally a construct concerning attention, then it is important to show both its convergence with, and divergence from related attentional constructs. Among the most frequently studied constructs is attentional control, understood as the capacity to voluntarily select and focus on a specific object to the exclusion of others; this has been associated with several adaptive outcomes, such as lower attentional bias to threatening information (Derryberry & Reed, 2002). Attentional control and mindfulness appear to have several adaptive outcomes in common. For example, both capacities involve an increased stability and continuity of attention toward a focal object, and both may be enhanced by training. Evidence supports a relation between them; two measures of mindfulness, the MAAS and the FFMQ Act with Awareness subscale moderately correlated with self-reported attentional control in a recent study (Brown, Goodman, & Inzlicht, 2012). Relatedly, Mrazek, Smallwood, and Schooler (2012) found modest negative correlations between the MAAS and four convergent measures of mind-wandering, a construct antithetical to attentional control. There is also evidence that mindfulness training improves attentional control (e.g., Chiesa, Calati, & Serretti, 2011). For example, Mrazek et al.
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(2012) found behavioral indicators of reduced mind-wandering following 8 minutes of mindfulness practice among novices, which converges with outcomes from studies of lengthier mindfulness training (Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010).

Despite such expectable relations, there is substantial theoretical divergence between mindfulness and attentional control. In particular, mindfulness is distinct in its interrelatedness with meta-awareness and its receptive quality to ongoing phenomena. The term meta-awareness has multiple meanings, the simplest being knowledge of the state of the mind at a given moment, including the quality of one’s attention (Brown & Cordon, 2009). The integration of attention and meta-awareness also helps to distinguish mindfulness from concentration, which deeply informs the attentional control construct (Derryberry & Reed, 2002). Thus, attention may be concentrated, but without meta-awareness to help preserve the continuity of focused attentiveness, it is lacking in mindfulness (see Brown & Cordon, 2009; Dreyfus, 2011 for further discussion). Mindfulness also involves a capacity to broaden the field of attention, or to “set up” awareness of an ever-widening domain of internal and external experiences. This involves the capacity to flexibly alter the breadth of attention, from a penetrative focus to a broad panoramic view of experience (Bodhi, 2004). Thus, mindfulness represents an attention capacity characterized by flexibility and breadth -- qualities distinct from the concentrated nature of attentional control.

From this brief theoretical overview, it follows that measures of mindfulness should be associated with attentional control – as initial evidence reviewed earlier showed – but also predict theoretically relevant outcomes over and above attentional control. Emerging evidence supports this incremental validity (Brown et al., 2012; Quaglia, Goodman, & Brown, 2013). For example, Brown et al. (2012) found both the MAAS and FFMQ Act with Awareness measures to
predict reduced amplitudes of the late positive potential (LPP) -- an electrocortical indicator of emotional reactivity-- in response to unpleasant, high arousal images after controlling for attentional control (which was not related to LPP amplitudes in this study). Additionally, the MAAS and other measures of dispositional mindfulness have been related to specific mental health, physical health, interpersonal, and behavioral outcomes for which research on attentional control has had little to say.

Taking together this theory and evidence, there is currently little basis to conclude that trait mindfulness measures like the MAAS are merely capturing “experienced lapses of attention” (Grossman, 2011, p. 1038), a contention of mindfulness scales grounded in the problematic notion of face validity, the superficial appearance, or face value of scale items as reflections of a construct. Because it relies on subjective judgment, face validity is typically not a scientific criterion for judging the value of a measure (e.g., Gravetter & Forzano, 2009; Walsh & Betz, 2001). However, we believe that self-report measures of the mindfulness should be the subject of rigorous empirical scrutiny. Studies using self-report measures of mindfulness should incorporate measures of attention to assess their convergent, discriminant, and incremental validity. In addition to concerns with validity, such research will enhance our understanding of how mindfulness fits into the nomological network of other, established indexes of attention (e.g., Posner & Rothbart, 2007).

Are Measures of Dispositional Mindfulness Valid Predictors of Regulatory Outcomes?

Mindfulness is studied scientifically in three primary ways: As an outcome of formal mindfulness training (e.g., cumulative hours of practice), as a state evoked by brief exercises among mindfulness-naïve populations, and as a disposition via psychometric instruments. Despite common interests, researchers must guard against the assumption that these distinct
modes of inquiry are capturing the same phenomenon (Davidson, 2010), or that they are predicated on the same foundational assumptions about mindfulness. Examination of the similarities and differences among the findings from these different measurements of mindfulness will help address many of the validity concerns regarding the use of self-report mindfulness measures. If the three methods show convergent results, this would lend credence to the claim that they are examining the same phenomenon, or at minimum, a closely related family of phenomena. In this section, we review evidence demonstrating empirical convergence between these three operationalizations—psychometric, induction, and intervention—particularly focusing on a widely-researched outcome of interest, emotion regulation.

Eight self-report measures of trait mindfulness for adult respondents have been published. Three of these measures – the FFMQ (Baer et al., 2006), its ancestor the KIMS (Baer et al., 2004), and the MAAS (Brown & Ryan, 2003) – have been used most widely. Despite differences in their conceptual foundations and intended uses, the FFMQ/KIMS and the MAAS have shown correlations with theoretically meaningful indicators of well-being and psychopathology (for a review see Brown, Ryan, & Creswell, 2007). In fact, a major area of convergence in findings between self-report measures of mindfulness and mindfulness-based and mindfulness-integrated interventions is in mental health outcomes. The MAAS and FFMQ, for example, have been correlated with lower anxiety, depression, mood disturbance, perceived stress and other mental health indicators. Mindfulness-based interventions, including Mindfulness-based Stress Reduction (MBSR; Kabat-Zinn, 1990) and Mindfulness-based Cognitive Therapy (MBCT; Segal, Teasdale, & Williams, 2004), have been shown to beneficially impact the same and similar indicators (see Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004; Hofmann, Sawyer, Witt, & Oh, 2010 for reviews).
Physiological Concomitants of Emotion Regulation

Given research showing that mindfulness and its enhancement are related to mental health, research has recently sought to examine whether this quality of attention, and training to enhance it, can improve emotion regulation, a key underpinning for mental health, behavior regulation, social relationships, and other domains of adaptive functioning (Gross, 1998). According to Gross (1998), “Emotion regulation refers to the processes by which individuals influence the emotions they have, when they have them, and how they are experienced and expressed.” (p. 275). While still nascent, evidence from research on dispositional mindfulness, mindfulness inductions, and mindfulness interventions has shown convergence across neural, neuroendocrine, and other physiological levels of analysis.

Neural Markers of Affective Style. Several correlational and experimental studies have examined whether mindfulness promotes positive affective style. Affective style refers to individual differences in emotional reactivity and regulation in response to emotional provocation (Davidson, 1998). The most widely used measure of affective style is hemispheric brain asymmetry in electrical activity in the prefrontal cortex. Captured using electroencephalography (EEG), prefrontal asymmetry reflects the magnitude of hemispheric differences in the frequency of alpha-band activity, where greater relative left-sided alpha activity has proven a reliable indicator of generally positive affective style (but see Harmon-Jones & Harmon-Jones, 2011), and associated with approach motivation, higher subjective and eudaimonic well-being (Urry et al., 2004), and adaptive responses to stressors (Davidson, 2000). Conversely, greater relative right-sided alpha activity has been associated with avoidance motivation, withdraw-oriented dispositions, and the experience of some negative emotions (Davidson, Ekman, Saron, Senulis, & Friesen, 1990).
Recent research from our lab revealed that higher levels of MAAS-assessed dispositional mindfulness were associated with greater relative left-sided alpha activity in prefrontal regions (Goodman, Brown, & Haver, 2012). In contrast, measures of depression and emotion dysregulation were associated with more right-predominant alpha asymmetry. Mindfulness training has shown similar results. Davidson and colleagues (2003) found that, compared to wait-list controls, participants in an 8-week MBSR program showed significant shifts from baseline levels toward greater relative left-sided cortical activation at the end of the program, and at four months after training. This shift toward a more positive affective style was associated with improvements in immune functioning, as measured by antibody response to flu virus inoculation. Similar shifts toward left-sided asymmetry have been found among participants with substantially less meditation practice. Students who practiced mindfulness of breathing for an average of 6-13 minutes a day over the course of a 5-week training program exhibited significant shifts toward left-sided activation compared to controls (Moyer et al., 2011). Even a brief mindfulness induction, operationalized as a 15-minute guided breath meditation, produced significant shifts toward left-sided asymmetry among depression sufferers (Barnhofer, Chittka, Nightingale, Visser, & Crane, 2010). In sum, dispositional mindfulness, induced mindfulness, and mindfulness training have each predicted prefrontal alpha asymmetry in a manner indicative of positive affective style.

Neal Markers of Emotional Reactivity. Another recent area of inquiry on mindfulness and emotion regulation has used neuroimaging to identify changes in brain structure and activation patterns tied to dampened emotional reactivity. In particular, this research has examined brain activation in regions associated with emotion-relevant threat detection, particularly the bilateral amygdalae and areas of the prefrontal cortices. For example, patients
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with social anxiety disorder showed reduced amygdala activity following an 8-week MBSR intervention (Goldin & Gross, 2010). In a healthy stressed sample Hölzel et al. (2010) found significant within-subject reductions in perceived stress following an MBSR program, and the degree of change in perceived stress was significantly correlated with decreases in gray matter density in the right amygdala. MBSR participants have also demonstrated less neural reactivity to a sadness provocation compared to controls (Farb et al., 2010), and reduced activity in the right amygdala during an induced state of mindfulness (Farb et al., 2007).

Studies examining the functional neural correlates of dispositional mindfulness are fewer, but consistent with results from mindfulness training. The Observe subscale of the KIMS has been correlated with lower amygdala activity (Frewen et al., 2010), and MAAS scores have been associated with less amygdala activation at rest (Way et al., 2010) and during socioemotional threat (Creswell et al., 2007). Recently Taren, Creswell, and Gianaros (2013) found that MAAS scores were associated with smaller gray matter amygdala volume, and Taren et al. (2013) found these scores to correlate with reduced amygdala-ACC resting state functional connectivity, a potential mechanism for stress resilience. Both studies provide evidence for a neurobiological pathway to explain how mindfulness may regulate emotional responses.

Neuroimaging research has also identified mindfulness-related activation differences in prefrontal cortical regions involved in emotion regulation, such as the dorsomedial prefrontal cortex (DMPFC), and the orbitofrontal cortex (OFC), which have been associated with emotional reappraisal (Davidson, 2000; Oschner & Gross, 2005) and the top-down inhibition of amygdala activity (Quirk & Beer, 2006). Among meditators with 1100-17000 hours of practice, cumulative hours of meditation significantly predicted gray matter thickness of the OFC (Hölzel et al., 2008), and increases in OFC activation have been found in people after as little as 4 days of
mindfulness training (Zeidan et al., 2011). Evidence has also shown increases in DMPFC activations following MBSR (Farb et al., 2010).

Similar patterns of activation have been predicted using scales sensitive to individual differences in mindfulness. The Observe and Act with Awareness subscales of the KIMS have predicted increases in DMPFC activity (Frewen et al., 2010), and total KIMS scores have predicted increases in DMPFC activation, which in turn were associated with reduced amygdala activation during the reappraisal of negative stimuli (Modinos et al., 2010). Additionally, the MAAS has been significantly related to increases in OFC activity during states of rest (Way et al., 2010) and increases in right and life ventrolateral prefrontal cortex (VLPFC), ventromedial prefrontal cortex (VMPFC), MPFC, and right dorsolateral prefrontal cortex (DLPFC) during socioemotional threat (Creswell et al., 2007). Creswell et al. (2007) also found strong negative associations between a number of these PFC regions and the amygdala among higher MAAS scorers, suggesting a more efficient PFC down-regulation of amygdala responses. Thus, measures of dispositional mindfulness have predicted similar patterns of neural activation in the prefrontal cortex as those attributed to formal mindfulness training.

**Neuroendocrine Markers of Stress.** These activation patterns in the PFC and amygdala have been associated with reduced secretions of salivary cortisol (Urry et al., 2006), a neuroendocrine marker of stress responses that can compromise healthy immune and other biological functioning when chronically activated. Emerging research (Brown, Weinstein, & Creswell, 2012) has shown that dispositional mindfulness modulates cortisol and affective responses during the Trier Social Stress Task (TSST), a reliable induction of social evaluative threat (Dickerson & Kemeny, 2004). Similar reductions in cortisol after acute stress have been discovered following only 5 days of mindfulness-integrated training (Tang et al., 2007).
Paralleling these findings, women diagnosed with breast cancer who completed an MBSR program showed lower cortisol levels under social evaluative threat compared to controls (Witek-Janusek, Albuquerque, Rambo-Chroniak, Chroniak, Durazo-Arvizu, & Mathews, 2008). Salivary cortisol levels and autonomic stress responses have been shown to decrease from 6-14 months post-MBSR (Carlson, Speca, Faris, & Patel, 2007). Cardiovascular responses are also subject to stress, and reductions in autonomic (cardiovascular) stress reactivity during the TSST were found to correlate with the frequency of meditation practice among participants in a mindfulness-integrated training program (Kemeny et al., 2012). These results have been corroborated in an investigation of the role of dispositional mindfulness on TSST-related heart rate variability responses (Holt, 2012).

Interestingly, recent electrocortical research on dispositional mindfulness suggests that the modulating role of this quality of attention on emotional reactivity may begin very soon after stimulus contact. As noted earlier, Brown et al. (2012) found that MAAS and FFMQ Act with Awareness scores predicted reduced event-related potential amplitudes following the display of highly arousing unpleasant images, specifically in the late positive potential – an electrocortical marker of emotional arousal beginning 400-500 ms after stimulus onset. These findings suggest that dispositional mindfulness plays an emotion regulatory role during an early phase of emotion processing, potentially lessening or even circumventing the need for reappraisal, response modulation, and other, “downstream” emotion regulatory efforts. Yet experimental research with induced and trained mindfulness is needed to show whether this early modulation of reactivity to emotionally provocative stimuli can be attributed to mindfulness itself, rather than factors that may be associated with it.

*Disposition Mindfulness as a Moderator of Mindfulness Training Effects*
The convergent findings discussed here do not definitively demonstrate that research on dispositional, induced, and trained mindfulness are investigating the same phenomenon. Yet a final body of evidence we briefly review adds further weight to this proposition. Specifically, evidence has shown that changes in dispositional mindfulness are sensitive to participation in mindfulness interventions. For example, within-subject differences in Freiburg Mindfulness Inventory dispositional mindfulness (Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006) were found among subjects following a brief 4-day mindfulness training intervention (Zeidan et al., 2011). Significant increases in trait mindfulness were also observed on several FFMQ subscales (Act with Awareness, Observe, and Non-Judging) among participants in an MBSR intervention (Hölzel et al., 2011). Further, FFMQ mindfulness was found to mediate the relation between formal mindfulness practice and measures of symptom reduction and well-being (Carmody & Baer, 2008), suggesting that the increases in dispositional mindfulness resulting from mindfulness practice were at least partially responsible for the adaptive outcomes.

Similar results have been found with the MAAS. MBSR interventions have resulted in within- and between-subject improvements in MAAS-assessed mindfulness in several recent studies (e.g., Jensen, Vangilde, Frokjaer, & Hasselbalch, 2012; Kilpatrick et al., 2011). Finally, in a study of chronically depressed individuals, Michalak, Heidenreich, Meibert, and Schulte (2008) found that higher MAAS scores at post-MBCT significantly predicted lower risk of depressive relapse/recurrence up to a year following treatment.

It has been argued (Grossman, 2011) that the evidence for pre-post treatment mindfulness score changes only suggests that trainees are likely to endorse more mindfulness scale items at the end of training than at baseline. However Brown, Ryan, Loverich, Biegel, & West (2011) responded that in the common practice of pre-post training assessment, participants are not likely
to know what each scale they complete actually measures, being administered as part of a battery of similar scales. Further, some scales, such as the MAAS, have not shown evidence of social desirability or other response bias (Brown & Ryan, 2003). Shapiro, Brown, Thoreson, and Plante (2011) also showed that dispositional (MAAS) improvements were maintained up to a year after MBSR training, when any enthusiastic flush from the training had likely dissipated. Brown et al. (2011) also note that scores on self-report scales can change in an unexpected direction after mindfulness training, as Brown, Kasser, Linley, Ryan, and Orzich (2009) found with the FMI. Finally, that fact that changes in scaled mindfulness have tracked changes in mental health outcomes over time in expected directions (e.g., Brown & Ryan, 2003; Shapiro, Brown, Thoresen, & Plante, 2011) suggests that the increases in dispositional mindfulness associated with mindfulness training are not only veridical, but also helpful in gauging whether training programs produce the key outcome they are designed for – namely, cross-situationally stable mindfulness.

In sum, research to date supports the criterion validity of several psychometric measures of trait mindfulness. It reveals that there are meaningful differences in mindfulness between untrained and trained populations, and that variance in the disposition predicts subjective and neurophysiological indicators of adaptive emotional functioning in ways consistent with experimental realizations of mindfulness. Perhaps most importantly, dispositional mindfulness appears to predict adaptive emotional and biological functioning in ways consistent with current theory about mindfulness, mindfulness training, and their effects.

**How Does Mindfulness Develop?**

Self-report measures of mindfulness have been commonly used in research involving participants who have little or no formal training in mindfulness. The application of self-report
measures among untrained populations raises three questions concerning the development of mindfulness: (1) Are measures of trait mindfulness actually assessing mindful capacities if, as Grossman (2011) has argued, mindfulness is dependent on formal training for its cultivation? (2) If, as Kabat-Zinn (2003) and others have argued, mindfulness is an inherent capacity of the mind, why are some people more mindful than others, as reflected in mindfulness scale score variance? And (3) How can research on the development of mindfulness be used to inform our understanding of its enhancement?

*Are Measures of Trait Mindfulness Assessing Mindful Capacities?*

Jon Kabat-Zinn (2003), the founder of the MBSR program writes that, “mindfulness…being about attention, is also of necessity universal. There is nothing particularly Buddhist about it. We are all mindful to one degree or another, moment by moment. It is an inherent human capacity” (pp. 146). Consistent with this understanding, Brown & Ryan (2003) write, “Recognizing that most everyone has the capacity to attend and to be aware, we nonetheless assume…that individuals differ in their propensity or willingness to be aware and to sustain attention to what is occurring in the present” (p. 822). These views stand in contrast to the argument that mindfulness is only the result of practice, a state that cannot be easily evoked among novices, and “requires gradual refinement by means of systematic practice…and is markedly different from everyday modes of awareness” (Grossman, 2011, p. 1035). In this view, only those who have engaged in specific, formal mental training exhibit mindfulness.

In parallel with this disagreement within the scientific community, there are also differing views among scholars on whether qualities such as mindfulness are inherent to the human mind (e.g., Olendzki, 2011). Dunne (2011) suggests these views fall along a spectrum from Innatist to Constructivist. The former view holds that, because qualities such as mindfulness are innate or
inherent to the person, progress is marked by removing factors that obscure them. Conversely, Constructivists tend to emphasize the acquisition and construction of these qualities.

Is mindfulness a rarified state open only to those undergoing training? Whether mindfulness is accessible to regular people and “beginners,” or can only be experienced by those trained in it is a point of debate that will not be resolved here. But evidence that this capacity can be enhanced through training is clearly consistent with viewing mindfulness as a natural capacity. As Brown et al. (2011) note, when it comes to mindfulness, we all start somewhere. As discussed earlier, several measures of dispositional mindfulness predict theoretically meaningful outcomes consistent with mindfulness theory and practice, even among untrained respondents (see Brown et al., 2011 for further discussion).

Why are Some People More Mindful than Others?

Most scholars and mindfulness researchers agree that formal mindfulness practice is the “royal road” to stabilize higher mindfulness. Research supports the claim that such practice is indeed related to higher mindfulness. For example, Brown and Ryan (2003) found that Zen meditators reported significantly higher mindfulness than age-, gender- and geographic location-matched non-meditators. In a randomized controlled trial, Shapiro et al. (2011) found that MBSR participants had higher levels of mindfulness than cohort controls, measured immediately after the intervention and at 2 and 12 months following the intervention. Similarly, Jensen et al. (2012) found greater increases in dispositional mindfulness among MBSR participants compared to controls.

Yet factors outside the context of formal mindfulness training may also foster the development of mindfulness (Brown & Ryan, 2004). To date, little research has sought to identify the physiological, psychological, and socioenvironmental factors that may impact levels
of dispositional mindfulness. But incipient research suggests that dispositional mindfulness may vary according to a number of factors, from genetics to caregiver-child attachment style to classroom educational supports. For example, Murakami, Matsunaga, and Ohira (2009) recently discovered that differences in a serotonin transporter gene polymorphism (5HTTLPR) modulated the effects of a brief mindfulness induction on parasympathetic nervous system activity under conditions of emotional provocation, suggesting that genetics may contribute to the capacity to enter into a mindfully attentive state.

While many kinds of learning and skill development are considered domain specific, in that training in one domain does not influence performance in other domains, it has been theorized that training in attention may generalize to a variety of functional domains (Posner & Rothbart, 2007). Consistent with this view, differences in cognitive processing resulting from formal meditation training have been shown to generalize to performance on a variety of tasks, presumably because they target core processes such as attention (Jha, Krompinger, & Baime, 2007; Slagter, Davidson, & Lutz, 2011) and working memory (Jha et al., 2010). Given the ubiquity of these core processes across a wide variety of tasks suggests that fundamental mindful capacities may be trained during activities that necessitate the deployment of attention.

Social developmental factors such as caregiver-child attachment style may also relate to the development of mindfulness (Ryan, Brown, & Creswell, 2007; Shaver, Lavy, Saron, & Mikulincer, 2007). Shaver et al. (2007) pointed out that mindfulness and attachment security are associated with similar positive outcomes, and those authors found that insecure attachment styles were related to lower dispositional mindfulness. While preliminary, this research suggests that supports for the development of secure attachment may sharpen mindful capacities. Social Emotional Learning (SEL), typically promoted in school-based interventions, may be
functionally related to mindfulness. Among its five central competencies are self-awareness, self-management, and social awareness (Collaborative for Academic, Social, and Emotional Learning, 2005). A recent meta-analysis of 213 SEL studies found greater social and emotional skills, as well as improved academic performance in participants versus controls (Durlak et al., 2011). Social modeling may also enhance mindfulness through exposure to the attentiveness of others (Ryan et al., 2007). For example, an adaptation of MBCT for use with children (Semple, Lee, Rosa, & Miller, 2009) incorporates parent training to model mindful intentions and behavior at home. Children randomized to this adaptation of MBCT exhibited fewer attention problems than wait-listed controls, and these changes were still present 3 months later. Along the same line, Goodman, Trapp, and Davis (2013) found that perceived support for autonomy and competence in classroom contexts facilitated mindfulness among students before their final examination, which then predicted better exam performance.

While investigating developmental and contextual factors that may enhance natural capacities for mindfulness is important, it is also valuable to explore factors that could inhibit its development. For example, dissociation and emotional numbing, experiences common to post-traumatic stress disorder, have been considered antithetical to mindfulness (Follette, Palm, & Pearson, 2006). A history of psychological symptoms, such as anxiety, depression, and perceived stress may be due to underlying factors, including attention biases, that also impede the natural development of mindfulness (Harvey, Watkins, Mansell, & Shafran, 2004). This may help to explain why clinical interventions incorporating mindfulness have shown as good or better outcomes in some populations than treatments that do not incorporate mindfulness (e.g., Piet & Hougaard, 2010; Segal et al., 2010). Many forms of psychotherapy encourage an open, receptive attention to even challenging aspects of personal experience (Brown & Ryan, 2004; Martin,
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1997), but interventions specifically incorporating mindfulness may also target patterns of attention that are biased against aversive internal experiences. This correction could ultimately lead to increased mindfulness.

Widely regarded as one of the most important Buddhist documents on mindfulness practice, the Satipaṭṭhāna Sutta is clear that mindful presence can be applied in the most ordinary of day-to-day tasks (Nanamoli & Bodhi, 1995). We suggest that while formal mindfulness training is the most clearly marked path to develop mindfulness, other causes and conditions may also be at play. Dispositionally mindful individuals may experience several factors that promote the development of this quality. Research is needed to discover these factors.

*What is the Relation Between Informally and Formally Developed Mindfulness?*

There may also be a beneficial synergy between informally developed mindfulness and formal mindfulness training. Shapiro et al. (2011) found that dispositional mindfulness moderated the relation between MBSR and its numerous beneficial outcomes in a sample of undergraduate students. Those reporting higher dispositional mindfulness before the MBSR program benefited more from the intervention, evident in larger increases in mindfulness, higher subjective well-being, empathy, and hope, and larger decreases in stress. Revisiting the distinction between the Innatist versus Constructivist views on mindfulness, the present discussion suggests a third possibility, namely that informally developed mindfulness may support the effectiveness of systematic training. Thus, dispositional mindfulness could be likened to a raw material, like a gemstone, whose inherent qualities are enhanced through careful efforts.

**Conclusion**

Research on dispositional mindfulness has sparked a variety of contentious issues concerning the definition, operationalization, validity, and development of mindfulness. Here we
have attempted to show how several individual difference measures of mindfulness have contributed to the development of theory and to a growing body of empirical findings on mindfulness. To better understand the nature and expression of trait mindfulness, research would do well to examine attentional covariates of mindfulness in addition to the relations between mindfulness and neurally mediated systems of attention (Posner & Petersen, 1990). Longitudinal studies examining biological and contextual factors that influence the development of dispositional mindfulness may foster greater understanding of how to foster this quality and improve mindfulness training programs. These and other investigations may not only help to address outstanding questions, but also create opportunities for researchers to expand and better integrate our knowledge of mindfulness, and thereby promote a more rigorous science on the topic.
References


attention to and efficient discrimination of others’ emotions. Unpublished manuscript, Virginia Commonwealth University.


Dispositional mindfulness research


