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# From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness ☆,☆☆

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ABSTRACT

Theory suggests that heightening *state* mindfulness in meditation practice over time increases *trait* mindfulness, which benefits psychological health. We prospectively examined individual trajectories of state mindfulness in meditation during a mindfulness-based intervention in relation to changes in trait mindfulness and psychological distress. Each week during the eight-week intervention, participants reported their state mindfulness in meditation after a brief mindfulness meditation. Participants also completed pre- and post-intervention measures of trait mindfulness and psychological symptoms. Tests of combined latent growth and path models suggested that individuals varied significantly in their rates of change in state mindfulness in meditation during the intervention, and that these individual trajectories predicted pre-post intervention changes in trait mindfulness and distress. These findings support that increasing state mindfulness over repeated meditation sessions may contribute to a more mindful and less distressed disposition. However, individuals' trajectories of change may vary and warrant further investigation.



## 1. Introduction

Although mindfulness-based interventions fundamentally rely on the cultivation of mindfulness, the nature of this cultivation process is not well understood scientifically. Mindfulness is characterized by a nonjudgmental awareness of and attention to moment-by-moment cognition, emotion, and sensation without fixation on thoughts of past and future (cf. Kabat-Zinn, 1990). It has been conceptualized as a *state* practiced in mindfulness meditation (e.g., Lau et al., 2006) and as a *trait*, in terms of one's predisposition to be mindful in daily life (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). Without intervention, trait mindfulness appears to be stable over time (e.g., Brown & Ryan, 2003). However, several studies have found that mindfulness-based interventions (MBIs; e.g., Mindfulness-Based Stress Reduction, or MBSR; Kabat-Zinn, 1990) increase trait mindfulness on average and that such changes in trait mindfulness contribute to psychological health benefits from MBIs (e.g., Carmody, Reed, Kristeller, & Merriman, 2008; Shahar, Britton, Sbarra, Figueredo, & Bootzin, 2010; Shapiro, Oman, Thoresen, Plante, & Flinders, 2008). In MBIs repeated meditation practice is thought to cultivate greater state mindfulness over time, which presumably contributes to increases in trait mindfulness. The scientific literature has not adequately examined, however, whether trajectories of change in state mindfulness in meditation over the course of an MBI relate to changes in trait mindfulness and psychological health.

Buddhist-based theories, and MBIs derived from them, posit that individuals can increase their propensity toward mindfulness in everyday life – i.e., trait mindfulness – by evoking the state of mindfulness repeatedly across meditation sessions (Davidson, 2010; Garland et al., 2010; Vago & Silbersweig, 2012). Theoretically, as individuals engender deeper states of mindfulness during meditation, they develop a greater tendency to exhibit mindful attitudes and behaviors outside of meditation, in the context of daily life. From a neurobiological standpoint, it likewise has been proposed that recurrent activation of the neural networks that instantiate state mindfulness in meditation lead to neuroplastic changes over time in brain function and structure which would promote greater trait mindfulness (Garland et al., 2010). Neuroscientific evidence on meditation and mindfulness practitioners provides some indirect support for this proposition, in that practitioners evidence significant differences (compared

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to non-meditators) and changes (pre-post intervention) in the function and structure of neural circuits that subserve neurocognitive processes linked with mindfulness (cf. Holzel et al., 2011).

In spite of this theorizing, little research has directly tested the proposition that increases in state mindfulness in meditation contribute to increases in trait mindfulness over the course of an MBI. Carmody and colleagues (2008) examined whether pre-post MBI changes in state mindfulness (assessed immediately after a brief period of quiet sitting, not meditation specifically) were associated with pre-post changes in trait mindfulness. Surprisingly, the relation was not significant. Other studies have examined the relation between state and trait mindfulness more generally, cross-sectionally (e.g., Thompson & Waltz, 2007), but this approach does not test the directional hypothesis of increases in state mindfulness (i.e., learning) through meditation leading to increases in trait mindfulness. Even a simple pre-post approach, such as Carmody et al.'s (2008), may be limited. Assessing only two sessions pre- and post-intervention may not reliably represent an individual's developmental trajectory (Rogosa & Willett, 1985) as a mindfulness practitioner. To more reliably assess trajectories of change in state mindfulness in meditation during an MBI, state mindfulness may need to be measured repeatedly, over multiple meditation sessions, during the intervention period.

With sufficient repeated measures of state mindfulness in meditation during an MBI, individual variability in trajectories of change can be examined. This has not been an explicit focus in previous research but may be important for understanding how recurrent activation of the state of mindfulness can be consolidated into the trait of mindfulness. Individual differences in rates of learning and change have been observed in other domains (Ackerman, 1987; Rogosa & Willett, 1985) and may exist for MBI practitioners. Anecdotally, some participants bemoan their difficulties learning to be mindful in meditation while others seem to take to the practice more quickly. Such difficulty versus ease of learning may stem at least partly from individual differences (e.g., personality traits, gene X environment interactions; cf. Uher, 2011) in predisposition toward neuroplastic changes proposed to underlie increases in mindfulness. Individuals who are predisposed to more rapidly develop the capacity to access deeper states of mindfulness across repeated meditation sessions may be more likely to increase in trait mindfulness by the end of an MBI. Therefore, individual variability in the rate of increase in state mindfulness over repeated meditations is important to assess and may be critical for understanding the relation between changes in state mindfulness in meditation and changes in trait mindfulness.

Individual rates of change in state mindfulness in meditation over the course of an MBI may also be important for improvements in psychological health. At least two studies have found that pre-post MBI changes in state mindfulness are associated with psychological health outcomes (Gayner et al., 2012; Lau et al., 2006). As mentioned earlier, changes in trait mindfulness also are associated with such outcomes (e.g., Carmody et al., 2008; Shahar et al., 2010; Shapiro et al., 2008). Given that increases in state mindfulness in meditation are theorized to lead to greater trait mindfulness over time and trait mindfulness benefits psychological health, it seems likely that trajectories of change in state mindfulness in meditation might be associated with psychological health only indirectly, through changes in trait mindfulness. On the other hand, it also is conceivable that individuals' rates of change in state mindfulness may be indicative of propensity to change in other adaptive ways as well; from this perspective, rates of change in state mindfulness may also uniquely predict changes psychological health. Such questions remain relatively unexplored and require better assessment of mindfulness practitioners' trajectories of state mindfulness in meditation along with measures of trait mindfulness and psychological health.

Therefore, the purpose of the present research was to prospectively examine individual trajectories of state mindfulness in meditation over the course of an MBI, using multiple repeated measures of state mindfulness in meditation, in relation to changes in trait mindfulness and psychological health. We had three hypotheses:

(1) There would be significant variability in individual trajectories of state mindfulness in meditation.
(2) These individual trajectories of state mindfulness in meditation would predict residualized change in trait mindfulness from pre- to post-intervention.
(3) Individual trajectories of state mindfulness in meditation would predict residualized change in psychological distress from pre- to post-intervention. We did not have a specific *a priori* hypothesis for whether trajectories of state mindfulness would be linked to post-intervention distress only indirectly, through changes in trait mindfulness, or also directly, independent of trait mindfulness. Therefore, we explored both possibilities.

## 2. Method

The study employed a prospective, observational design with repeated measures over the course of a mindfulness-based intervention.

### 2.1. Participants

Participants were recruited from an eight-week, self-pay, community-based mindfulness program that is based on MBSR (Kabat-Zinn, 1990) and offered several times each year by the University of North Carolina Program on Integrative Medicine. At an orientation session prior to the start of the intervention, program participants were given the option to enroll in the research for a modest reduction in the program fee. Program participants were eligible for the study if they were at least 18 years old, fluent in English, and able to complete repeated surveys online.

The sample of consisted of $N = 235$ research participants. Demographic characteristics of the sample were: 75% female; 83% White; $M_{age} = 44.83$, $SD_{age} = 14.32$; 62% with graduate degrees; 60% with household income > $60,000. Approximately 57% of participants completed at least four weekly assessments and pre-post measures.

### 2.2. Measures

#### 2.2.1. Trait mindfulness

The Five-Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is a widely used, 39-item inventory assessing trait mindfulness overall and as a multidimensional construct. Several studies attest to the instrument's psychometric properties (e.g., Baer et al., 2006; Christopher, Neuser, Michael, & Baitmangalkar, 2012). Items were rated on a 5-point scale ranging from 1 (*never or very rarely true*) to 5 (*very often or always true*). Higher total scale scores indicate higher overall trait mindfulness, the focus of the present research.

#### 2.2.2. State mindfulness

The Toronto Mindfulness Scale (TMS; Lau et al., 2006) is a 13-item instrument assessing state mindfulness, with good psychometric properties. Items are rated on a 5-point scale ranging from 0 (*not at all*) to 4 (*very much*). Higher total scores indicate higher overall state mindfulness.