



Trait mindfulness correlates with individual differences in multisensory imagery vividness



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ABSTRACT

Background: Trait mindfulness is a multifaceted construct, although its association with measures of personality and individual differences remains poorly understood. Given that guided mindfulness meditations (MM) frequently involve focused imagery and are typically experienced as pleasant, we predicted that visual and embodied imagery vividness would mediate the association between mindful observing traits and pleasant experiences in response to guided MM.

Study objectives and methods: 137 undergraduate students and 371 participants from Amazon's MTurk web service completed questionnaire measures of mindfulness traits and multisensory imagery vividness. They then completed an 8–10 min MM involving guided imagery of visualizing and embodying the positive characteristics of natural objects (a mountain, sun, or tree). Participants rated the level of imagery vividness they experienced in the visual and embodied modalities as well as their emotional responses to the MM.

Results: Mindful “observing” correlated with increased imagery vividness, both in response to standardized questionnaire and a guided MM. As predicted, vividness of visual and particularly embodied imagery mediated the association between trait mindful observing and experienced pleasantness in response to the MM.

Conclusions: Individual differences in vividness of visual and embodied imagery are a construct of relevance to understanding mindfulness both as a state and trait.

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1. Introduction

Most well documented in the visual stream, much research demonstrates that people can differ markedly with regard to the vividness with which they experience mental imagery (Cui, Jeter, Yang, Montague, & Eagleman, 2007). For example, instructed to visualize (with eyes closed) a mountain, sun or tree “within one's mind's eye”, some participants will report “seeing” the image “perfectly clear and as vivid as normal vision” whereas others will report seeing “no image at all, only knowing that [they] are thinking of an object” (e.g., *Vividness of Visual Imagery Questionnaire*; Cui et al., 2007; Marks, 1973; Marks & Isaac, 1995). More recently, researchers have begun to document similar individual differences within other sensory–motor modalities, for example, for imagined sound, taste, touch, bodily sensations, and emotion (e.g., using the *Plymouth Sensory Imagery Questionnaire* [PSIQ]; Andrade, May, Deeprose, Baugh, & Ganis, 2014). The vividness with

which an individual experiences mental imagery is thought to further relate with variability in the depth and acuity with which people perceive and experience the external world (Cui et al., 2007; Rademaker & Pearson, 2012), and may also be correlated with variability in how persons experience their bodily and emotional selves. Indeed guided imagery has long been used in psychotherapy and self-development practices as a means of improving affect regulation (e.g., Bigham, McDannel, Luciano, & Salgado-Lopez, 2014; Chiesa & Serretti, 2011; Esplen, Garfinkel, Olmsted, Gallop, & Kennedy, 1998; von Wietersheim, Wilke, Röser, & Meder, 2003), fostering character strengths (e.g., critical thinking; Krejci, 1997, heightened self-esteem; Omizo, Omizo, & Kitaoka, 1998), and increasing athletic performance (e.g., Murphy, 1994).

Positive outcomes have also been described for mindfulness-based therapeutic interventions, including for stress reduction (e.g., Khoury et al., 2013; Khoury, Sharma, Rush, & Fournier, 2015) and improving cognitive function (e.g., Sedlmeier et al., 2012). Interestingly, it has been suggested that individual variability in the experienced vividness of imagery during guided meditations may be predicted by individual differences in mindfulness (Bedford, 2012). Mindfulness itself is generally described within the literature as a subjective state involving non-judgmental awareness focused on the present moment (Bishop et al.,

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2004; Kabat-Zinn, 2003, 2005). However, within contemporary psychological literature, mindfulness is equally if not more often studied as a trait, with trait mindfulness presently considered a multidimensional construct often measured with the *Five Facet Mindfulness Questionnaire* (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006), which differentiates between the following five mindfulness-related traits: observing, describing, acting with awareness, non-judging (acceptance), and non-reactivity (decentering). Whereas most traits associated with mindfulness are negatively correlated with negative affective traits (e.g., neuroticism; Giluk, 2009) and distress (e.g., depression and anxiety; Chambers, Gullone, & Allen, 2009; Radford et al., 2014), the association of trait mindful *observing* with measures of well-being is less well understood. For example, Baer and colleagues found that mindful observing is related to measures associated with negative affective traits in non-meditators, but measures associated with positive affective traits in meditators (Baer et al., 2006, 2008).

In our view, mindful observing appears to measure variability in the disposition of persons toward a heightened awareness of multisensory stimuli, for example, with the FFMQ mindful observing scale including survey items assessing how frequently one “pays attention to physical experiences, such as the wind in their hair or the sun on their face”, “pays attention to sounds, such as clocks ticking, birds chirping, or cars passing”, “notices the smells and aromas of things”, and “notices visual elements in art or nature, such as colours, shapes, textures, or patterns of light and shadow”. Understanding mindful observing as implying heightened sensory awareness, and given that imagery vividness has been robustly associated with perceptual acuity (Finke, 1980; Finke & Kosslyn, 1980; Waller, 2012), we therefore sought to evaluate whether persons who score higher in mindful observing traits would also experience greater imagery vividness during the practice of multisensory mental imagery. Indeed to our knowledge, individual differences within the domains of trait mindfulness and vividness of multisensory imagery have never been studied in context with each other, and therefore whether mindfulness traits and individual differences in multisensory imagery are associated is not yet known.

The present study therefore investigated associations between trait mindfulness and multisensory imagery vividness both during and outside the context of a pleasant guided meditation practice. Outside the context of meditation, we expected trait mindful observing to concurrently predict individual differences in vividness in response to imagery across various sensory modalities. Further, in response to generally pleasant, guided meditation practices, we focused our investigation on vividness of imagery in two specific modalities, visual imagery (e.g., imagine “seeing” a tree, mountain, or the sun) and embodied imagery (e.g., imagine “feeling like you are” or imagine “being” a tree, mountain, or the sun), both thought to be relevant to the practice of certain mindfulness meditations. In response to guided meditations that were designed to include visual and embodied imagery practices as such, we further hypothesized that persons higher in trait mindful observing would experience greater felt pleasantness directly as a consequence of (i.e., as mediated by) the greater vividness of visual and embodied imagery such persons were expected to experience during the meditation. Of further note, our hypotheses were evaluated in two settings, first in groups ranging from 5 to 10 who were tested in person in a university psychological laboratory, and secondly, online using Amazon’s Mechanical Turk web service; use of the latter sample was intended to broadly investigate the feasibility of conducting mindfulness and imagery research via the internet.

2. Methods

2.1. Participants

172 participants were recruited from the undergraduate psychology student pool at the representing university. Additionally 500 participants were recruited online through Amazon’s Mechanical Turk

(MTurk) service. Participants ranged from 18 to 70 years within the internet sample ($M = 35.97$ years, $SD = 11.47$) and 18–28 years ($M = 18.88$ years, $SD = 1.34$) within the undergraduate sample. The majority (68%) of the internet samples were women, while for the undergraduate samples, sex was evenly distributed between males (50.3%) and females (49.7%). A majority of participants from the internet sample self-identified as Caucasian (76%), with the remaining equally distributed among other ethnicities. In comparison, 44% of the undergraduate samples were self-identified as Caucasian, 40% were identified as Asian, and the remainder were evenly distributed among other ethnicities.

2.2. Measures

2.2.1. Five Facet Mindfulness Questionnaire

(FFMQ; Baer et al., 2006). The FFMQ is an often used and well validated measure that assesses five separate facets of trait mindfulness: (1) observing, (2) describing, (3) non-judging, (4) non-reactivity, and (5) acting with awareness. Each subscale demonstrated adequate to high internal consistency for both sample populations (α ranged from .81 to .88 for the internet sample, and from .64 to .78 for the undergraduate sample).

2.2.2. Plymouth Sensory Imagery Questionnaire

(PSIQ; Andrade et al., 2014). The PSIQ is a recently developed 35-item self-report questionnaire that assesses the vividness of sensory imagery within the following seven modalities (5-items per subscale): Sight, Sound, Smell, Taste, Tactile, Bodily-Kinesthetic, and Emotional Feelings. In response to each described stimulus or event, participants are instructed to close their eyes for about 10 s and try to form mental images, then rating how vivid they experience each image. Questions were rated on an 11-point scale between 0 (“no image at all”) to 10 (“Image as clear and vivid as real life”). Some examples of PSIQ items include: “the appearance of a friend you know well” (sight), “the sound of hands clapping in applause” (sound), “the smell of rose” (smell), “the taste of toothpaste” (taste), “touching a soft towel” (tactile), “yourself threading a needle, focusing on your bodily sensations” (bodily-kinesthetic), and “feeling excited” (emotional). Each subscale demonstrated adequate to high internal consistency for both sample populations (α ranged from =.78 to .90 for the internet sample, and from =.72 to .88 for the undergraduate sample).

2.3. Procedure

All participants provided informed consent, and the procedure was approved by an independent university ethics review board. Participants were either tested in person in groups of 10 or fewer (student participants), or took part anonymously online via an internet connection of personal convenience as recruited through Amazon’s Mechanical Turk web service (MTurk). Participants were compensated in the form of academic credit (students) or monetarily (internet sample; \$1.50 USD). It is acknowledged that such a monetary amount is perhaps insufficient to directly motivate individuals to participate via the internet, and thus that all such participants must be assumed to have been at least minimally intrinsically motivated to complete the study. Survey administration was implemented using Qualtrics software. Participants first completed the FFMQ or the PSIQ in counter-balanced order. They were then instructed to practice, with their eyes closed, one of three guided embodiment meditations from the *Mindfulness and Metta Trauma Therapy* (MMTT) website (www.mmtt.ca; Frewen, Rogers, Flodrowski, & Lanius, 2015) titled by Frewen et al. as “Mountain Imagery”, “Tree Imagery”, and “Sun Imagery”. Which of the three meditations a participant practiced was chosen by random assignment as implemented by Qualtrics. As described by Frewen et al., during these meditations participants first engage in visual imagery referring

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