Mindfulness
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ORIGINAL PAPER

Evidence that Attentional Stance Shift is Learned Rapidly, Reliably Induces Mindfulness, and Constitutes a Distinctive Marker of Cognitive Process

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Abstract

Objectives Objective assessment of mindfulness requires increased precision in defining associated cognitive processes. Previous work argued that *vipaśyanā*-like mindfulness can be characterized as a specific *attentional stance*—how the felt sense of self is located relative to the body. We therefore studied effect of specific shifts in attentional stance on stress reduction, mindfulness, and interoceptive awareness indices in meditation novices and Mindfulness-Based Stress Reduction (MBSR) practitioners.

Method This paper reports on three separate studies using a simple pre-test post-test design with meditation novices and MBSR practitioners, all of whom received brief instruction (≤1 hr) in an attentional stance expected to induce *vipaśyanā*-like mindfulness. Novices and MBSR practitioners then participated with a 10-min recorded version of the attentional stance exercise (ASE) and were assessed on measures of perceived stress and mindfulness. MBSR practitioners were similarly assessed after a 10-min MBSR practice. One group of novices was also assessed on measures of interoceptive awareness and three positive emotions.

Results In novices, the 10-min ASE resulted in reductions in significant stress indices and increases in mindfulness and interoceptive awareness indices. In MBSR practitioners, the ASE and MBSR practices produced similar results in stress and mindfulness. In MBSR practitioners, attentional stance in the abdomen was associated with a modestly greater, and marginally significant, increase in mindfulness than that in the chest.

Conclusions Brief training and a short practice session entering a diffuse abdominal attentional stance yield stress reduction and increases in mindfulness similar to the impact of an MBSR meditation practice used by trained MBSR practitioners. Attentional stance is associated with specific biologically linked and cognitively relevant somatic markers, making it an effective behavioral instrument for obtaining objective data and mechanism assessment in *vipaśyanā*-like mindfulness.

Keywords Mindfulness · Stress reduction · Seat of attention · Attentional stance · Self-location · Somatic markers

Mindfulness is shown to have a range of benefits for mental health and well-being (e.g., Eberth & Sedlmeier, 2012; Goyal et al., 2014; Khoury et al., 2013, 2015; Querstret et al., 2020; Sumantry & Stewart, 2021), yet there is insufficient precision in conceptualizations of mindfulness to objectively differentiate its various forms. For example, EEG is as yet unable to empirically distinguish between distinctly different practices associated with traditional mindfulness such as focused awareness and open monitoring meditation practices (e.g., Garcia et al., 2024). Mindfulness meditation techniques in turn differ substantially from cognitive mindfulness, a self-reflexive thoughtfulness described as a form of *metacognition* (e.g., Andrei et al., 2016; Haldeman & Hartelius, 2022; Philipp et al., 2020). If specific categories of mindfulness are to be objectively assessed, greater

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precision is needed in defining the underlying cognitive processes.

One approach to this task would be the identification of perceptible somatic markers of cognitive process that would be less vulnerable than verbal instructions to the vagaries of semantics. For example, instructions to "let go" of thoughts and emotions (e.g., Tobin, 2016) could be interpreted by one person as a shift in focus of attention from inner conversation to sensate experience, while another might take it as an invitation to dissociate from sensate experience. Identifying such perceptible markers of cognitive process entails several challenges. First, potential markers must be both empirically demonstrated to correlate with cognitive processes and reliably perceptible as body-located sensations; somatic markers proposed by Antonio Damasio were empirically verified but not necessarily detectable in experience (Bechara & Damasio, 2005; Damasio et al., 1991). Second, increased specificity is required in the phenomenology of subjective experiences; among several such attempts (e.g., Lutz et al., 2002; Pekala & Kumar, 2000; Timmermann et al., 2023; Varela, 1996; Walsh, 1995), there is as yet only modest evidence of sense-accessible and empirically verifiable cognitively relevant somatic markers (e.g., Lutz et al., 2002; Nelson et al., 2020; Pekala et al., 2010). Third, careful distinction must be made between *introspection*—unstructured internal reflection on thoughts and feelings that has long been discredited (e.g., Hurlburt & Heavey, 2001; Nisbett & Wilson, 1977)—and specific *internal sensations* based on interoceptive awareness, some of which may be reliable markers of cognitive process. That Wilhelm Wundt made this distinction between introspection, which he rejected, and internal sensation, which he utilized, has been demonstrated by Danziger (1980).

Hartelius et al. (2023) proposed that internal sensation be used to identify cognitively relevant somatic markers of mindfulness states that accord with traditional and contemporary descriptions of mindfulness. There is preliminary evidence that self-regulation of *attentional stance*—the internal sensation of self-location—can be used to manage one's *global cognitive state* (Hartelius et al., 2022). Change in global cognitive state refers to an alteration in the cognitive environment such that psychological capacities and resources are prioritized in a different manner (Hartelius, 2015; McKilliam, 2020). Cognition in this context is viewed broadly, including the full spectrum of an organism's knowledge and information-processing functions (whether or not these are within awareness). The concept of global cognitive state is preferred to more conventional terms such as *state of consciousness*, since there are numerous definitions of consciousness and little consensus on how any of these could be usefully divided into distinct, measurable states.

Attentional stance is a recently developed psychological construct that refers to variations in the location of the receptive *seat of attention*—the bodily location where the attending self is felt to be located (Hartelius & Goleman, 2016; Hartelius et al., 2022). This internal source or *seat of attention* is distinct from what attention is directed towards—the external target of attention. Together these two parameters comprise the attentional stance. Philosophers of the classic era described an equivalent of attention as visual rays that emanated from the eyes and reflected information back to the viewer about objects at which it was directed (Lindberg, 1971), thereby assuming that the experience of attending to stimuli always originated from the same location. Psychological research has often described focal attention as a spotlight that similarly assumes focus on a target from a uniform locus of origin (e.g., Eriksen & St. James, 1986; Heitz & Engle, 2007). This misses the fact that attention has an adjustable source in the body from which it is perceived to originate, much in the way a fireman can hold their hose down by the waist or over the shoulder.

A change in this adjustable seat of attention creates a change in attentional stance. Just as one's relationship to objects in the environment changes according to whether viewing is done from ground level or a tenth floor balcony, a shift in attentional stance results in a different attentional perspective and a changed relationship with the target of attention. Participant reports of experienced self-location have commonly located the sense of self in the head (Bertossa et al., 2008), in the heart area (Fetterman & Robinson, 2013), or distributed between the head and chest (Alsmith & Longo, 2014; Anglin, 2014; Hanley et al., 2021; Limanowski & Hecht, 2011; Starmans & Bloom, 2012; van der Veer et al., 2018, 2019). In another approach to assessing self-location, stimuli became associated with the self when presented near the head or the upper torso, but not when presented at other body locations (Schäfer et al., 2019).

Attentional stance has been shown to affect global cognitive state, emotional temperament, self-construal, social and moral attitudes, and social functioning, and repeated deployment of the same attentional stance has been shown to create reliably similar patterns of brain activation (Hartelius et al., 2022). As such, attentional stance appears to be a key variable in self-regulation processes such as mindfulness. Given that shifts in attentional stance can be facilitated by regulation of self-location (Hartelius et al., 2023), it is noteworthy that Dambrun et al. (2023) have reported decreased self-location in the head and increased self-location in the torso and/or limbs in mindfulness meditators using body scan and breathing meditation practices.

Based on a comparison between EEG results and some traditional descriptions of Buddhist meditation, it has been suggested that the attentional stance in which the seat of attention is felt to be situated diffusely in the abdomen is likely similar to a global cognitive state cultivated by the practice of *vipaśyanā* (Hartelius et al., 2023; Fig. 1).

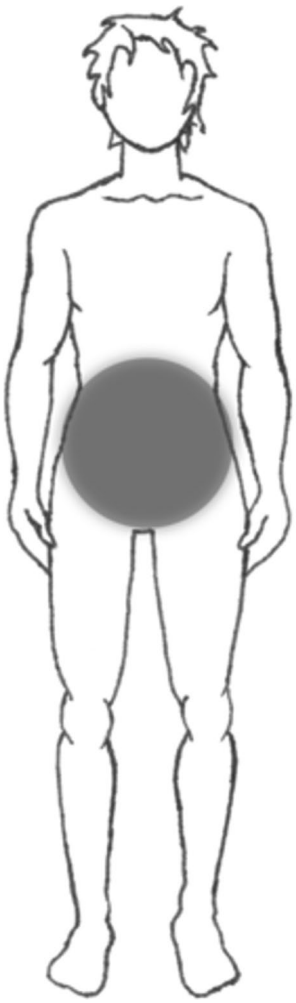

Fig. 1 The predicted attentional stance of *vipaśyanā*

EEG measurements of this attentional stance were found to correlate strongly with EEG patterns associated with three positive emotions, including gratitude and serenity (Hartelius et al., 2022), both of which have been identified as low-arousal positive affect states (Cordaro et al., 2024). This suggests that the diffuse abdominal stance induces a low-arousal positive affect state (LAPA), which has been associated with both mindfulness and positive mood (McManus et al., 2019, 2024).

Given the simplicity and precision of attentional stance exercises, a mindfulness protocol based on this approach would likely provide a more reliable induction for the purposes of neural measurement. Considering that participants in our prior study were able to self-regulate their attentional stance rapidly and with relative ease (Hartelius et al., 2022), it should be the case that *brief instruction* and a *short practice session* in entering a *diffuse attentional stance* in *the abdomen* would result in an increase in mindfulness and mindfulness-related behaviors such as *positive emotion* (Amutio et al., 2015) and *interoception* (Cebolla et al., 2016; Chiesa et al., 2013), as well as a *decrease in stress* (Khoury et al., 2015).

The following three studies were conducted to test for the expected behavioral effects using a simple pre-test post-test design. Study 1 assessed for initial evidence of beneficial impact on stress and mindfulness in 15 meditation novices after a brief training and short practice session in a diffuse abdominal attentional stance. Previous research had predicted that use of this attentional stance bore similarity to *vipaśyanā*-style mindfulness meditation (Hartelius et al., 2023), a tradition often represented in contemporary research by Mindfulness-Based Stress Reduction (MBSR; Chiesa & Serretti, 2010; Kabat-Zinn, 2003). MBSR reflects this Buddhist meditation tradition based on the *vipaśyanā* origins of MBSR's central practice, the body scan (Anālayo, 2020), and has been referred to as the "gold standard model" of a mindfulness-based intervention due to its standardized format (Reive, 2019; Van Dam et al., 2018). As an initial evaluation of this predicted similarity, Study 2 recruited 15 MBSR practitioners in order to compare the behavioral effects of short practice sessions of MBSR meditation with those of a diffuse abdominal stance. Study 3 attempted to replicate and extend the findings of Study 1 with a second group of 15 meditation novices by assessing the impact on stress and mindfulness of brief training and a short practice session with the diffuse abdominal attentional stance, but adding assessments of interoceptive awareness and the positive emotions of gratitude, contentment, and compassion. These results, if promising, would indicate the value of future study with a more complex study design.

Study 1 Method

This study is one arm of a two-armed study comparing the effects of a brief attentional stance exercise (ASE) training on mindfulness novices with its effect in MBSR practitioners. A sample of meditation novices were taught how to shift the seat of attention from its usual location in the head or upper torso to a diffuse attentional stance in the abdomen. Validated measures of mindfulness and perceived stress, as specified below, were completed before and after the meditation, along with an assessment of the attentional stance achieved. It was hypothesized that a short instructional session on how to shift to a diffuse attentional stance in the abdomen, followed by a brief practice session, would reduce.

Participants

Fifteen meditation novices aged 18 to 75 years, living in the USA, possessing English reading and comprehension skills sufficient to answer psychological questionnaires, and with access to a personal computer that could be used in a

confidential setting, were recruited for the study. Individuals with formal meditation training or certification, with a serious mental illness, a terminal medical diagnosis, or any medical or psychological condition that would compromise their ability to participate, were excluded from the study. Participants were recruited from student populations in two universities. Those completing the study were offered a $10 gift card to a popular coffee shop chain; student participants from one university were offered course credit for participation in addition to the gift card.

Procedure

Applicants completed an online questionnaire to ensure they qualified for the study. All forms and measures in the study were completed through Qualtrics. Qualifying participants were randomly assigned to one of two groups, each of which completed the baseline measures in a slightly different sequence to mitigate any order effects, and then were contacted by one of the researchers and invited to participate in a 1-hr instructional session using protocols developed by Hartelius and Aizer (2024, pp. 38–39, 87–89). The instructional session consisted of guided practice in sensately identifying the seat of attention in the head, then moving it from the head or upper body to the abdomen, and assuming a diffuse attentional stance in the abdomen, as well as guidance in resolving obstacles to successful practice using protocols that address body-located dissociated ego states, similar to Smith and Hartelius (2020). Upon completion of the instructional session participants received a link to a 10-min recorded exercise guiding them in a similar process of assuming a diffuse attentional stance in the abdomen; this was followed immediately by post-intervention measures of mindfulness (EMQ) and perceived stress (PSS-10) as well as an assessment of their perceived self-location or attentional stance during the exercise.

Measures

Participants completed a demographics questionnaire and were assessed with a measure of mindfulness suited to post-practice reporting of experience during meditation, a common and well-validated measure of perceived stress, and an assessment of their attentional stance, as specified below. The demographics questionnaire was completed at the start of the study, and the Attentional Stance Assessment was completed after participation in the ASE; the remaining measures were completed as baseline measures at the start of the study and again after completing the ASE session. For measures completed post-test, participants were instructed to answer the questions based on their experience during the exercise at the times they felt the process was most effective.

Embodied Mindfulness Questionnaire (EMQ)

EMQ (Khoury et al., 2023) was chosen to assess mindfulness as experienced during a practice session and reported immediately post-session—a condition in which more widely used trait mindfulness measures such as the Five Facet Mindfulness Questionnaire (Baer et al., 2006, 2008) is unlikely to show significant change. The EMQ was chosen over the State Mindfulness Scale (SMS; Tanay & Bernstein, 2013) given that this study is centered on body-felt somatic markers thought to be associated with mindfulness, and in the SMS only 6 of 21 items refer to bodily experience.

The EMQ is a recently developed but well-validated 24-item self-report measure of mindfulness that includes aspects of embodied experience, with responses measured on a 5-point Likert scale offering the choice of *almost never*, *rarely*, *sometimes*, *often*, and *almost always* as possible answers. Subscales (validated with Cronbach's α) for positive dimensions of mindfulness (EMQp) include *detachment from automatic thinking* ($\alpha = 0.85$), *attention and awareness of feelings and bodily sensations* ($\alpha = 0.88$), *awareness of the mind–body connection* ($\alpha = 0.79$), and *acceptance of feelings and bodily sensations* ($\alpha = 0.82$), and for negative dimensions (EMQn) *disconnection from the body* ($\alpha = 0.97$). Convergent validity has been shown to be strongest with the Body Mindfulness Questionnaire (Burg et al., 2017) and the Five Facet Mindfulness Questionnaire (Baer et al., 2008). Test–retest reliability has not been evaluated for the EMQ.

Perceived Stress Scale (PSS-10)

The original Perceived Stress Scale (Cohen et al., 1983) is a 14-item self-report measure of how life events are assessed as stressful. The refined 10-item version (PSS-10; Cohen & Williamson, 1988) has become the most popular perceived stress measure (Karam et al., 2012). The scale has good internal consistency ($\alpha = 0.78$), with two factors: *perceived helplessness* and *perceived self-efficacy* (Taylor, 2015). Test–retest reliability correlation has been measured at $r = 0.86$ after 7 days (Siqueira Reis et al., 2010). Responses were reported on a 5-point Likert scale with the choice of *never*, *almost never*, *sometimes*, *fairly often*, and *very often* as possible answers (Cohen & Williamson, 1988).

Attentional Stance Assessment (ASA)

The novel construct of attentional stance was assessed by asking participants to indicate where they felt their sense of self was located when they were most successful with the attentional exercise, with *head*, *chest/arms*, *abdomen*, *pelvis*, and *legs* as possible answers, and with these areas of the body represented on an accompanying body outline. Scoring reflects distance of self-location from the head, which is

here assumed to be a common and culturally normal baseline (Bertossa et al., 2008; Starmans & Bloom, 2012). Accordingly, an attentional stance in the head received a score of 0, in the chest/arms a score of 1, and in or below the abdomen a score of 2. This is a newly developed scale on which no psychometric testing has been done.

Data Analyses

Participant responses were scored, and post-test scores were compared with baseline and analyzed for significance using two-tailed *t*-tests with the criterion significance level Bonferroni corrected to $p = 0.005$ for multiple applications. Findings passing the less stringent criterion of $p < 0.05$ were treated as marginally significant.

Study 1 Results

Fifteen participants (10 identified as "female" and 5 as "male") were recruited through electronic announcements, supplemented by participant referrals. Mean age was 40.5 (range: 25–60 years), with 9 of 15 identifying as non-Hispanic White (60.0%), 2 as White of Spanish, Hispanic, or Latino origin (13.3%), 2 as Black (13.3%), and 2 as Other (13.3%). Ten of 15 held a bachelor's degree (67.7%), 4 held a master's or professional degree (26.7%), and 1 had some college education (7.7%).

Mean duration of the instructional session in shifting the seat of attention to the target attentional stance was 32 min (range: 20–60 min). Mean time between the instructional session and completion of the recorded exercise was 3.2 days (range: 0–19 days); 10 of 15 participants participated in the recorded exercise at least one day after the instructional session, while 5 participants completed the exercise the same day.

Statistically significant reductions in stress and increases in mindfulness were reported by the participants (Fig. 2, Table S1 in Supplementary Information). After participation in the recorded exercise, perceived stress as measured by the PSS-10 decreased by 69.3% from pre-test, with a majority of this change in its *perceived helplessness* subscale. Positive mindfulness-related behaviors as measured by the EMQ increased 49.9%, with no significant decrease in negative mindfulness-related behaviors. Twelve of 15 participants (80%) reported achieving the target attentional stance in the lower torso, 1 reported self-location in the chest (7%), and 2 reported it in the head (13%). For the 12 participants who reported shifting the seat of attention to the abdomen, mean instructional time was 32.1 min and mean time between instructional session and completion of the recorded exercise was 2.3 days (range: 0–9 days).

Study 1 Discussion

This study with meditation novices yielded statistically robust results of a 69.3% decrease in perceived stress and a 49.9% increase in positive aspects of mindfulness after a brief instructional session (≤ 1 h) and participation in a 10-min recorded exercise. Twelve of 15 participants (80%) achieved the target attentional stance of self-location in the lower torso. Failure to achieve the target stance was not related to differences in duration of the instructional session nor time elapsed between the instructional session and practice with the recorded exercise.

This study demonstrated that decreases in stress and increases in mindfulness were associated with an 80% rate of reported participant success in achieving the target diffused

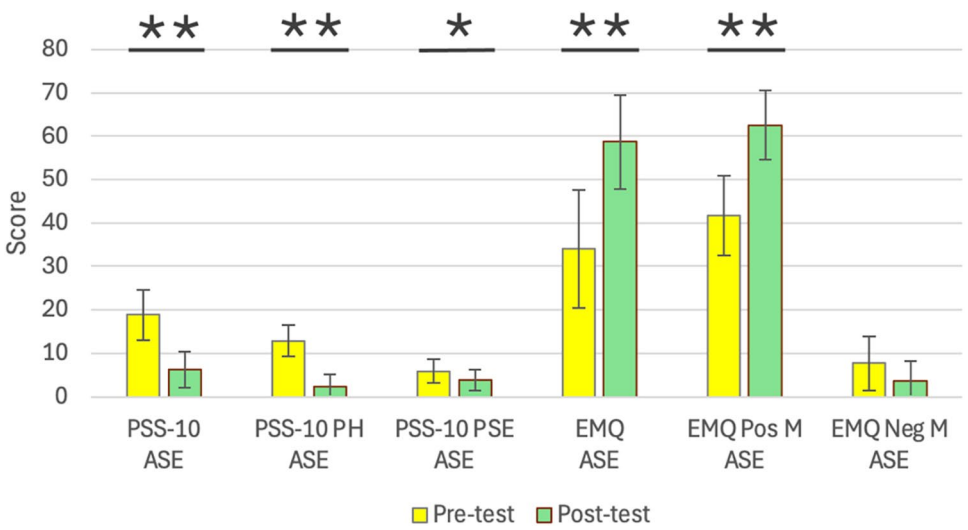

Fig. 2 Significant reductions in perceived stress (PSS-10) and increases in mindfulness (EMQ) after 10-min attentional stance exercise (ASE) in 15 meditation novices (Study 1). PH and PSE are *perceived helplessness* and *perceived self-efficacy* subscales of PSS-10, respectively. Error bars are ± 1 standard deviation (*SD*). *$p < 0.05$; **$p < 0.005$

attentional stance in the abdomen. However, it was not clear whether the change in attentional stance was a specific mechanism in achieving these results. Nor was it clear how similar or different this practice was from a well-studied mindfulness practice such as MBSR. These questions were examined in the second arm of the study focusing on individuals trained in MBSR and presented as Study 2.

Study 2 Method

Study 2 reports on a study comparing the effects of a brief ASE meditation training and exercise with trained and actively practicing MBSR practitioners. This is the second arm of a two-armed study that includes Study 1. In this study individuals who had completed an 8-week MBSR training course were provided with the same brief attentional stance instruction, as was done for novices in Study 1. The null hypothesis was that neither of the ASE nor the MBSR exercises would produce significant reductions in stress or increases in mindfulness in MBSR-trained practitioners, since it was expected that at baseline for this study MBSR practitioners would have lower levels of stress and higher levels of mindfulness than the novices of Study 1, so the additional brief training would not be likely to have a significant further impact. It was further expected that the MBSR exercise would be less successful in instigating the target diffuse abdominal attentional stance than the ASE procedure, since this goal is not typically articulated in MBSR training.

Participants

Fifteen MBSR-trained meditators age 18 or older, living in the USA with English reading and comprehension skills sufficient to answer psychological questionnaires, and access to a personal computer that could be used in a confidential setting, were recruited for the study through online study announcements at universities and published by a mindfulness center. Time elapsed since MBSR training varied: less than 1 year (3 participants), 1–2 years (3 participants), 3–5 years (3 participants), more than 5 years (6 participants). Three participants who reported engaging in MBSR practice less often than once per month were excluded from the study. Individuals with a serious mental illness, a terminal medical diagnosis, or any medical or psychological condition that would compromise their ability to participate, were excluded from the study. Participants were recruited from a university student population and notices posted through MBSR communities. Participants completing the study were offered a $10 gift card to a popular coffee shop chain.

Procedure

Applicants followed all the same steps as in Study 1, but with the additional step of participation in a 10-min MBSR meditation exercise. A link to a 10-min recording of a certified MBSR instructor leading an MBSR-style exercise was provided, and participants were told that if the style of the instructor differed from their own way of practicing an MBSR meditation, they should use the recording to keep within the prescribed time, but should follow their typical MBSR practice; this latter was assumed to be relatively homogeneous given that MBSR training is somewhat standardized. The two video recorded exercises were of the same length (10 min), were presented by individuals of the same gender (male), and used an identical visual background. To control for order effects MBSR participants were randomly assigned to a group of participants that received the link to the MBSR exercise first, or to another group that received the link to the ASE first, with the sequence of assessments reversed between groups. Immediately after participating in each exercise participants completed post-intervention measures of mindfulness (EMQ) and perceived stress (PSS-10). Self-report of attentional stance (as assessed with the ASA) during each exercise was also completed. Participants who practiced the ASE first completed the ASA after each exercise; participants who completed the MBSR meditation first assessed their attentional stance for both exercises after the ASE.

Measures and Data Analyses

Measures and data analysis for this study were identical with those used for Study 1.

Study 2 Results

Fifteen MBSR-trained participants (13 identified as "female" and 2 as "male") had a mean age of 54.5 (range: 38–74 years), with 9 of 15 identifying as non-Hispanic White (60.0%), 1 as White of Spanish, Hispanic, or Latino origin (6.7%), 1 as Black (6.7%), 1 as Asian (6.7%), 2 as mixed race (13.3%), and 1 declining to state their race (6.7%). Three of 15 held a bachelor's degree (20.0%), and 12 held a master's or professional degree (80.0%). Of an initial group of 18 participants, 3 were disqualified for reporting the frequency of their participation in MBSR practice as "rarely or never."

Mean duration of the instructional session in shifting the seat of attention to the target attentional stance was 27 min (range: 15–60 min). Mean time between the instructional session and completion of the recorded exercise was 3.9 days (range: 0–12 days); 13 of 15 participants participated in a

recorded exercise at least two days after the instructional session.

When compared with novices from Study 1, baseline measures of MBSR practitioners were significantly lower on the *disconnection from the body* subscale of the EMQ (2.6 MBSR; 7.7 novice; $p < 0.005$ [corrected]), suggesting that MBSR training and practice may be responsible for this greater sense of body connection.

Both exercises (MBSR, ASE) resulted in marginally significant decreases in stress and increases in mindfulness for MBSR practitioners as measured by PSS-10 and EMQ (Figs. 3 and 4, Table S2). Both practices also resulted in highly significant stress reductions as measured by the *perceived helplessness* subscale of PSS-10 (−60.0% ASE; −52.4% MBSR; sig. at $p < 0.005$ [corrected]), similar to novices in Study 1.

To determine whether the difference in stress reduction efficacy was due to type of meditation or the impact of change in attentional stance, pre- and post-test measures were compared between total instances in either practice (15 participants × 2 practices = 30 practice events) that were associated with a chest-located attentional stance ($n = 13$), and total instances associated with an abdomen-located attentional stance ($n = 13$). Achievement of the abdominal stance was associated with marginally significant beneficial changes in stress and mindfulness, and with significant reduction in stress on the *perceived helplessness* subscale of the PSS-10 (Fig. 5, Table S3). The chest stance was associated with marginally significant reductions in stress only. The difference between chest and abdominal stance changes was not significant for the stress-related *perceived helplessness* subscale (PSS-10), but was marginally significant for positive mindfulness-related subscales (EMQ; sig. at $p < 0.05$, uncorrected).

Analysis of participants showed that when engaged in an MBSR practice session, 3 participants reported an

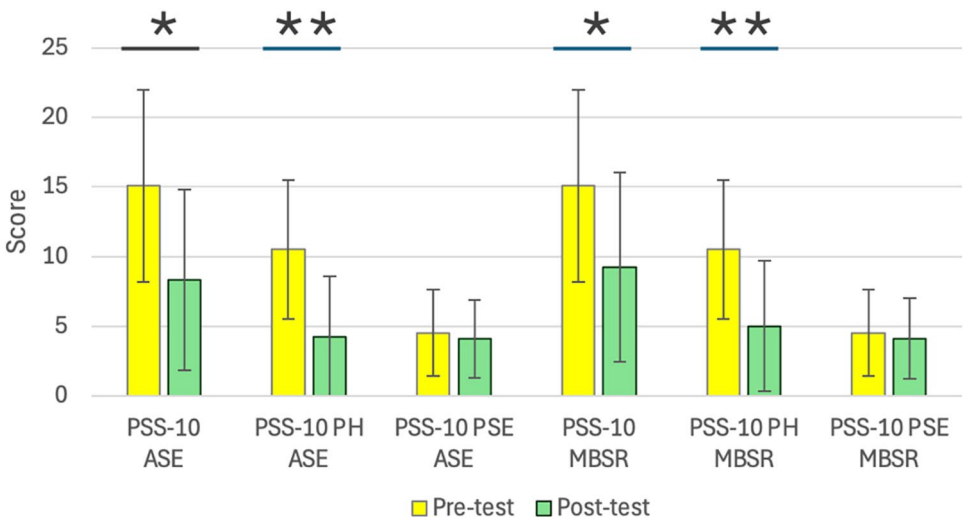

Fig. 3 Significant reductions in perceived stress (PSS-10) after attentional stance exercise (ASE) and MBSR in 15 MBSR practitioners. PH and PSE are *perceived helplessness* and *perceived self-efficacy* subscales of PSS-10, respectively. Error bars are ± 1 standard deviation (*SD*). *$p < 0.05$; **$p < 0.005$

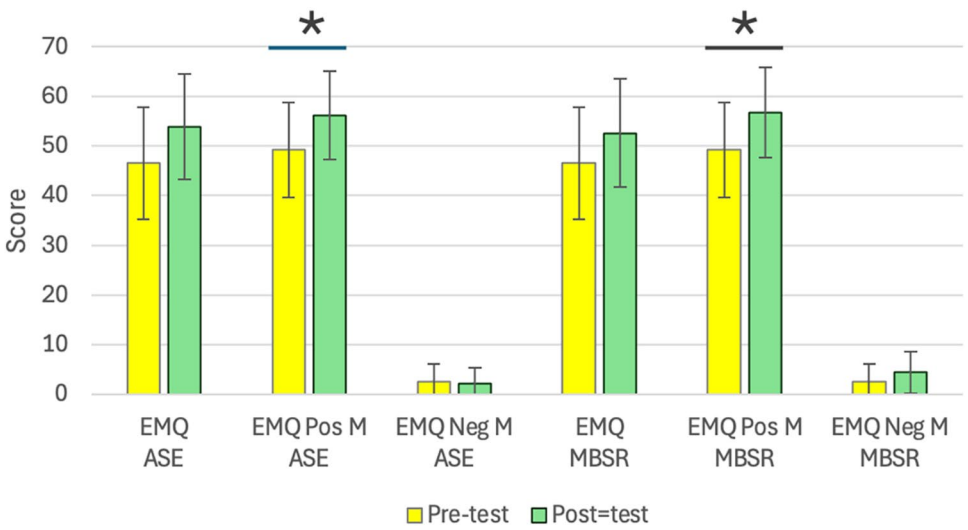

Fig. 4 Weak effects on mindfulness (EMQ) after attentional stance exercise (ASE) and MBSR in 15 MBSR practitioners. Error bars are ± 1 standard deviation (*SD*). *$p < 0.05$

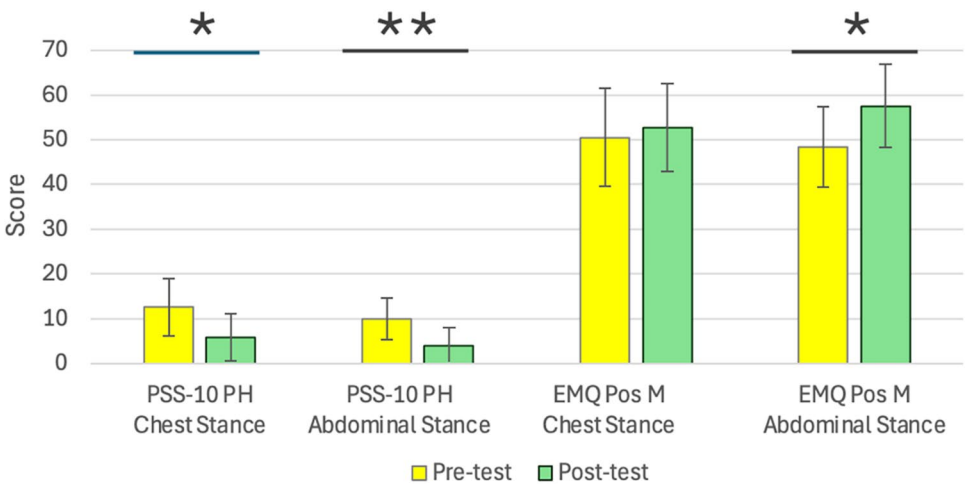

Fig. 5 Comparison of the effects of different attentional stances on dimensions of perceived stress (PSS-10) and mindfulness (EMQ) in practice sessions by MBSR practitioners. PH is the *perceived helplessness* subscale of PSS-10. Error bars are ± 1 standard deviation (*SD*). *$p < 0.05$; **$p < 0.005$

attentional stance in the abdomen, 8 reported their stance to be in the chest, and 4 reported the stance in the head. By contrast, when these same participants used the ASE practice, all but one reported achieving an attentional stance lower than the head, with 10 reporting it in the lower abdomen, and 4 in the chest. When the ASA score was calculated for each type of meditation, the ASE exercise scored significantly higher than the MBSR exercise, indicating greater overall achievement of an attentional stance in the abdomen (1.67 ASE; 0.93 MBSR; sig. at $p < 0.005$).

Study 2 Discussion

This study assessed the effects of a short instructional session (≤ 1 hr) and a subsequent brief practice session (10 min) shifting the attentional stance from its typically focused location in the head to a diffuse attentional stance in the abdomen. This novel intervention provided an effective strategy for stress reduction in meditation novices (Study 1). In MBSR practitioners it provided significant stress reduction comparable to a 10-min session of a familiar and well-practiced MBSR meditation.

The fact that 9 of 15 participants reported a different attentional stance for each of the two exercises confirms that they were engaging in a different mental state from that used in their familiar MBSR meditation. It is noteworthy that in this sample the ASE exercise was more often associated with an abdominal attentional stance than the MBSR exercise. Analysis of results by attentional stance showed modestly better outcomes on the positive mindfulness subscales of the EMQ with the abdominal stance than with the chest stance, regardless of the type of practice, and this difference achieved marginal significance ($p < 0.05$, uncorrected). This suggests that differences in mindfulness efficacy between ASE and MBSR are likely attributable to attentional stance, rather than to style of meditation.

Studies 1 and 2 provided evidence for the impact of the diffuse attentional stance in the abdomen on stress and mindfulness, but provided no evidence for its role in mindfulness-related behaviors such as interoceptive awareness and positive emotions; questions about these variables informed the design of Study 3.

Study 3 Method

This study was designed to replicate and extend the results of Study 1 by measuring the impact of a diffuse abdominal attentional stance on interoceptive awareness, degree of attentional diffusion, gratitude, contentment, and compassion in a second group of novice participants under the same protocol as for Study 1, but with an expanded set of outcome measures. It was expected that the ASE would decrease stress, increase mindfulness, interoceptive awareness, gratitude, and contentment, but not increase compassion since unlike gratitude and contentment, compassion is not a LAPA state.

Participants

Participant criteria and recruitment procedures were the same as for Study 1.

Procedure

Applicants followed all the same steps as in Study 1, but with the additional measures included in this study.

Measures

Participants completed a demographics questionnaire and validated measures of perceived stress (PSS-10) and

mindfulness (EMQ), as in Study 1. In addition, participants also completed a modified assessment of attentional stance and validated measures of interoceptive awareness, gratitude, contentment, and compassion.

Multidisciplinary Assessment of Interoceptive Awareness (MAIA-2)

MAIA-2 is a 37-item validated self-report assessment of interoceptive awareness—"the process by which the nervous system senses, interprets, and integrates signals originating from within the body" (Mehling et al., 2018, p. 1). It is currently the most comprehensive measure of interoceptive awareness. Responses are indicated on a 6-point Likert scale representing a span from *never* to *always*. Subscales (with Cronbach's α for reliability) include *noticing* ($\alpha = 0.64$), *non-distracting* ($\alpha = 0.74$), *not-worrying* ($\alpha = 0.67$), *attention regulation* ($\alpha = 0.83$), *emotional awareness* ($\alpha = 0.79$), *self-regulation* ($\alpha = 0.79$), *body listening* ($\alpha = 0.80$), and *trusting* ($\alpha = 0.83$). Test–retest reliability of a German version was measured at $r = 0.66$–0.79 after 113 days (Bornemann et al., 2015).

Modified Attentional Stance Assessment

This measure asked participants to indicate where they felt their sense of self was located when they were most successful with the attentional exercise, with *head*, *chest/arms*, *abdomen*, *pelvis*, and *legs* as possible answers, as in Study 1. These responses were scored in terms of *distance* of self-location from the head, with an attentional stance in the head receiving a score of 0, in the chest/arms a score of 3, in the abdomen or pelvis a score of 5, and in the legs excluded from calculation. This version was modified to also measure the *degree of diffusion*, asking participants to indicate whether their attention was held compactly close to the spine, whether it extended to the skin, or whether it extended into the space beyond the body. Scoring reflects degree of diffusion, with compact near the spine scoring 1, extending to the skin scoring 3, and extending beyond the skin scoring 5. The score range for distance from the head is thus 0–5, and for degree of diffusion the range is 1–5, with each aspect receiving a separate score.

The Gratitude Questionnaire (GQ-6)

GQ-6 (McCullough et al., 2002) is a single-factor 6-item self-report questionnaire that assesses proneness to the experience of gratitude in everyday life. Responses are indicated on a 7-point Likert scale including *strongly disagree*, *disagree*, *disagree slightly*, *neutral*, *slightly agree*, *agree*, and *strongly agree*. Internal consistency was initially measured at $\alpha = 0.82$. This measure was chosen for its short format.

Dispositional Positive Emotions Scale—Contentment (DPES-Cn)

DPES-Cn (Shiota et al., 2006) is a 5-item self-report scale that measures the presence of contentment in life. one-factor scale solicits responses on a 7-point Likert scale including *strongly disagree*, *disagree*, *disagree slightly*, *neutral*, *slightly agree*, *agree*, and *strongly agree*; internal consistency has been measured at $\alpha = 0.89$ (Dixson et al., 2018). This measure was chosen for its short format.

Dispositional Positive Emotions Scale—Compassion (DPES-Cm)

DPES-Cm (Shiota et al., 2006) is a 5-item self-report scale that measures the presence of contentment in life. This one-factor scale solicits responses on a 7-point Likert scale consisting of *strongly disagree*, *disagree*, *disagree slightly*, *neutral*, *slightly agree*, *agree*, and *strongly agree*; internal consistency has been measured at $\alpha = 0.87$ (Dixson et al., 2018). This measure was chosen for its short format.

Procedure

Applicants followed all the same steps as in Study 1, but with the addition of the assessments of interoceptive awareness, gratitude, contentment, and compassion at baseline and post-test.

Data Analyses

Participant responses were scored, post-test scores were compared with baseline and analyzed for significance using two-tailed *t*-tests with the criterion significance level Bonferroni corrected to $p = 0.005$ for multiple applications.

Study 3 Results

Fifteen (12 identified as "female" and 3 as "male") were recruited, including 4 from the previous novice group. Mean age was 54.5 (range: 38–74 years), with 11 of 15 identifying as non-Hispanic White (73.3%), 2 as Black (13.3%), 1 as Native American of Spanish, Hispanic, or Latino origin (6.7%), and 1 as Other (6.7%). Nine of 15 held a bachelor's degree (60.0%), 5 held a master's or professional degree (33.3%), and 1 had some college (6.7%) (Fig. 5).

Mean duration of the instructional session in shifting the seat of attention to the target attentional stance was 35 min (range: 15–60 m). Mean time between the instructional session and completion of the recorded exercise was 4.2 days (range: 0–16 days); 13 of 15 participants participated in the

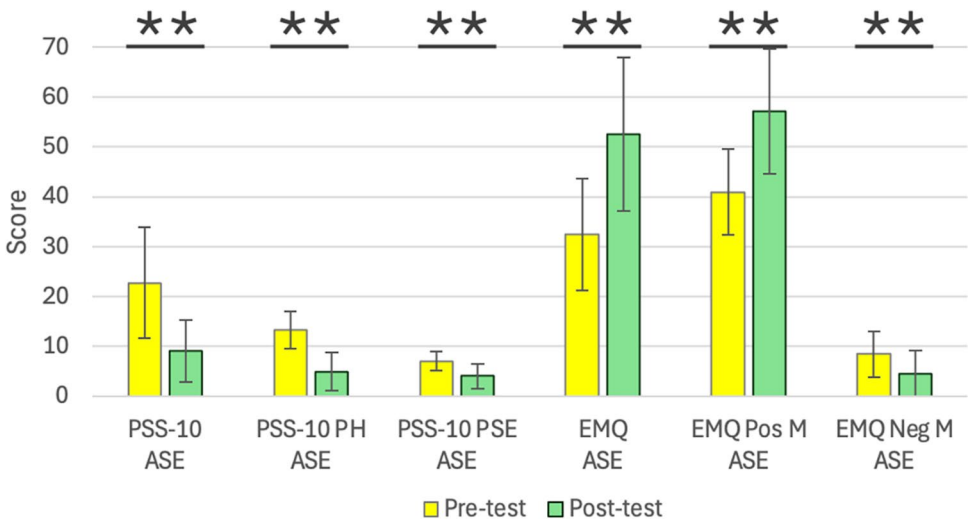

Fig. 6 Significant reductions in perceived stress (PSS-10) and increases in mindfulness (EMQ) after 10-min attentional stance exercise (ASE) in second group of 15 meditation novices (Study 3). PH and PSE are *perceived helplessness* and *perceived self-efficacy* subscales of PSS-10, respectively. Error bars are ± 1 standard deviation (*SD*). $^{**}p < 0.005$

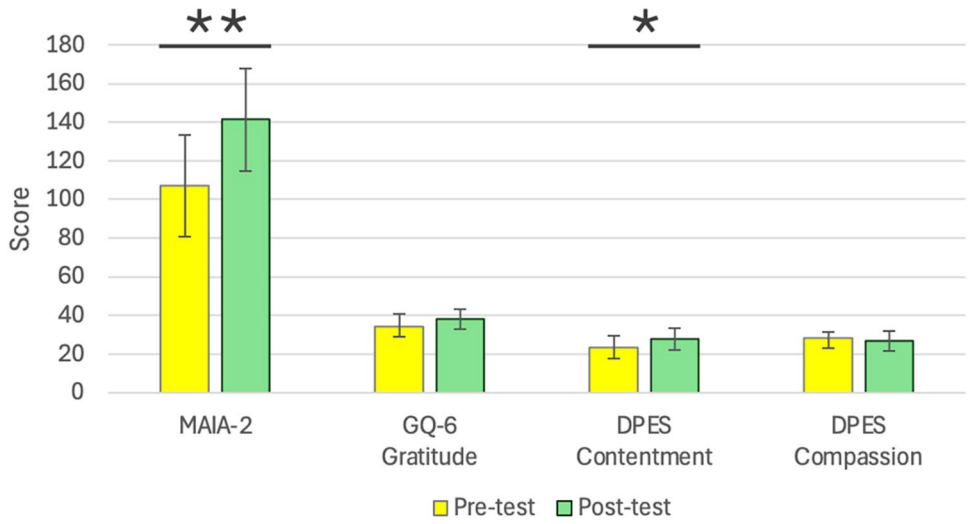

Fig. 7 Differential effects of the 10-min attentional stance exercise (ASE) on interoceptive awareness (MAIA-2), gratitude (GQ-6), contentment (DPES), and compassion (DPES) in the second group of 15 meditation novices (Study 3). Error bars are ± 1 standard deviation (*SD*). $^{*}p < 0.05$; $^{**}p < 0.005$

recorded exercise at least one day after the instructional session.

The sample showed significant decrease in stress and increase in mindfulness and interoceptive awareness at the $p < 0.005$ level (Figs. 6 and 7). After participation in the recorded exercise perceived stress as measured by PSS-10 decreased by 59.9% from pre-test, and positive mindfulness behaviors as measured by the EMQ increased 39.6% (Table S4). These results replicated the findings from Study 1. The study also found that interoceptive awareness increased 32.0%. Gratitude and compassion showed no significant change, but contentment showed marginal significance at the $p < 0.05$ level, uncorrected for multiple applications.

In order to determine the impact of accumulation from the brief instructional session, post-hoc re-analysis was performed on 6 novice participants in Studies 1 and 3 who completed the 10-min practice the same day as receiving instruction (duration of instruction: 27.5 min, range: 20–50 min) and 20 participants who completed the exercise at least one day after instruction (duration of instruction: 32.8 min, range: 15–60 min; gap after instruction: 4.9 days, range: 1–19 days; see Figs. S1 and S2, Table S5). This was possible since participants in both studies were novices who completed the same assessments of perceived stress (PSS-10) and mindfulness (EMQ) under identical protocols. Both samples showed statistically significant decreases in perceived stress and increases in mindfulness ($p < 0.005$). Stress decrease was significant on the overall PSS-10 score and on the *perceived helplessness* subscale, but not on the *perceived self-efficacy* subscale. Mindfulness increase was significant on the overall EMQ score and on the subscales measuring positive mindfulness-related behaviors, but there was no significant decrease in negative mindfulness-related behaviors. Differences between the 6 same-day completers and 20 later completers was significant only for scores on positive mindfulness-related subscales (EMQ; $p = 0.005$).

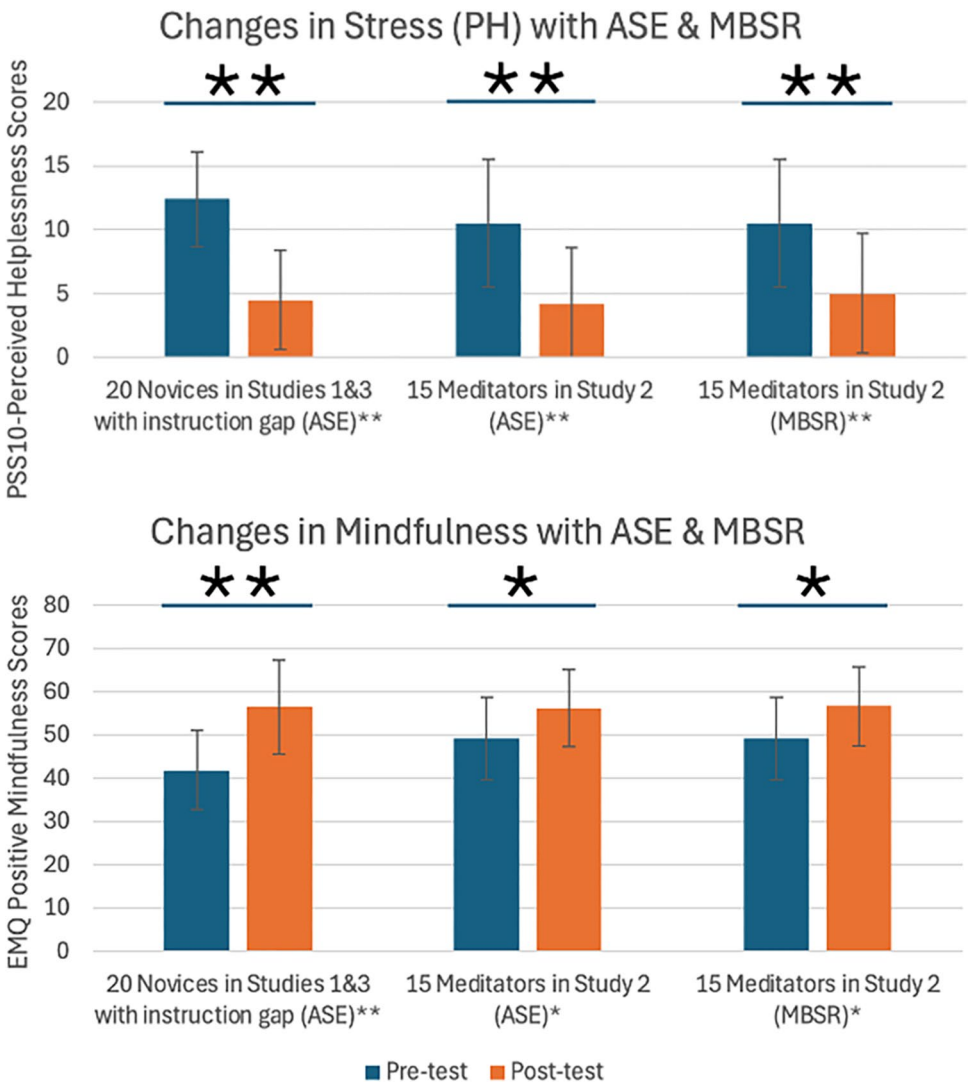

Fig. 8 The impact of the attentional stance exercise (ASE) on novices with post-instruction gap and ASE or MBSR practice on MBSR practitioners, on perceived stress outcomes (PSS-10; PH is the *perceived helplessness* subscale) and mindfulness outcomes (EMQ). Error bars are ± 1 standard deviation (*SD*). *$p < 0.05$; **$p < 0.005$

When results from the 20 novice participants who completed the practice session at least 1 day after instruction were compared with results from 15 MBSR practitioners in Study 2, it can be seen that the MBSR practitioners had lower baseline levels of stress and higher baseline levels of mindfulness than the novices, and that achieved levels of stress and mindfulness after the ASE practice session in either group and the MBSR session in the meditator group were similar (Fig. 8). This suggests that both processes result in similar beneficial effects during practice, and that sustained mindfulness practice improves baseline levels of stress and mindfulness.

Study 3 Discussion

Results from Study 3 were largely in line with expectation, replicating the results from Study 1 and showing significant beneficial changes in stress and mindfulness from a short instructional session (≤ 1 hr) and a subsequent brief practice session (10 min). Unlike the two prior studies, Study 3 showed significant decreases in stress on both subscales of the PSS-10. Given that mindfulness is associated with increases in interoceptive awareness (Cebolla et al., 2016; Chiesa et al., 2013; Hölzel et al., 2011; Lima-Araujo et al., 2022), the significant post-test increase in the MAIA-2 score (Fig. 7), which is a much deeper probe than simplistic measures such as perception of heartbeat, affirms an additional parallel between the ASE and *vipaśyanā*-like mindfulness.

The results from assessments of the positive emotions of gratitude, contentment, and compassion are important in two ways. Given that the ASE uses imaginal evocation of gratitude as a sensate marker to facilitate the process of shift in attentional stance (cf. Hartelius & Aizer, 2024), the minimal changes in positive emotions suggest that this aspect of the exercise is not central to its effect. Additionally, the only positive emotion to show marginal significance was contentment, which is a LAPA state and therefore congruent

with the diffuse abdominal attentional stance. Conversely, there was no significant change in compassion, which is not a LAPA state. While these assessments of positive emotion targeted emotional traits, assessments focused on transient affective states would likely be more sensitive for use in a limited timeframe.

General Discussion

The three studies presented here demonstrate that in these small samples of participants, adopting a diffuse attentional stance in the abdomen produced a *vipaśyanā*-like mindfulness state, evidenced by the fact that its impacts on stress and mindfulness paralleled those of Mindfulness-Based Stress Reduction (MBSR) practitioners using their own usual MBSR meditation exercise (Fig. 8). In addition, the impact of the diffuse abdominal stance on interoceptive awareness was comparable to what has been found in other mindfulness practices (Fig. 7; cf. Lima-Araujo et al., 2022). The purpose of comparing the ASE practice with MBSR is not to suggest that one is superior to the other—many types of mindfulness practice can be beneficial. Rather, this is an efficient adjunct to the array of mindfulness techniques, particularly given that the ASE can be associated with specific cognitively relevant somatic markers that are typically available to experience and that reliably produce highly similar patterns of cortical activity (Hartelius et al., 2022), it is a preferable candidate for use with collection of objective data for assessment of the mechanism and effects of mindfulness.

In line with prior predictions (Hartelius et al., 2023), a brief training (≤ 1 h) in achieving a diffuse abdominal attentional stance and a single ASE practice session with a 10-min recording typically conducted several days after instruction (4.0 days) resulted in a rapid, strong, and statistically significant decrease in stress both in novices (Studies 1 and 3) and in experienced MBSR meditators (Study 2). Stress reductions in novices were similar to those achieved by experienced meditators using either their own MBSR practice or the ASE (Fig. 8). In addition, novices reported comparable levels mindfulness as experienced meditators who used either their own MBSR practice or the ASE (Fig. 8). These outcomes support the claim that the effects of ASE are similar to those of MBSR.

The case for ASE as a mindfulness induction is strengthened by empirical evidence showing that activity in the beta and gamma frequency bands assessed with this attentional stance correlated strongly with patterns of brain activity associated with the positive emotions of awe, gratitude (beta), and serenity (gamma; Hartelius et al., 2022); gratitude and serenity are low-arousal positive affect states associated with mindfulness (Cordaro et al., 2024; McManus et al., 2019, 2024). Additionally, as has been noted elsewhere, the diffuse abdominal attentional stance accords with traditional descriptions of *vipaśyanā* practice (Hartelius et al., 2023). It seems reasonable to conclude that ASE produces a global cognitive state comparable to that resulting from MBSR practice—a state of mindfulness.

When attentional stance was disaggregated from type of meditation in novices and experienced meditators, the abdominal stance was associated with statistically significant stress reduction and mindfulness increase (Fig. 5, Table S3); by comparison, the chest stance yielded only a marginally significant decrease in stress. Given that the ASE focuses mainly on achieving a diffuse attentional stance in the abdomen, and that this process resulted in stress reduction and mindfulness gains similar to those of a well-known mindfulness practice (MBSR), this result suggests that future research should examine whether the targeted shift in attentional stance plays a mechanistic role in mindfulness.

It is important to note that in all three studies there was substantially greater reduction of stress on the *perceived helplessness* subscale of PSS-10 than on the *perceived self-efficacy* subscale. This difference supports the suggestion that the diffuse abdominal attentional stance is particularly related to *vipaśyanā* mindfulness, which has been clearly associated with acceptance and positive mood (Easterlin & Cardeña, 1998). Full acceptance of one's circumstances could be expected to decrease the experience of helplessness but would be less likely to promote a sense of self-efficacy. The fact that use of attentional stance training appears to enable precise stabilization of a specific category of mindfulness even on self-report measures suggests a potential for the enhanced accuracy and reliability required to define and objectively assess various discrete forms of mindfulness such as *vipaśyanā*, *śamatha*, and forms characterized as *metacognition*.

Limitations and Future Research

This study is limited by its small sample size and limited participant diversity, which restricts the robustness and generalizability of the results. The use of a one group pre-test post-test design is also limiting, as without randomized assignment to either control or placebo groups, this design does not control well for possible confounds such as demand characteristics or test–retest artifacts. The studies also have no follow-up assessments to determine durability of behavioral effects. Study 2 assessed MBSR practitioners on the same measures after completing separate practice sessions using either their own MBSR practice or a diffuse abdominal attentional stance, but there was no formal comparison of the results from the two practices. In Study 3, the measures used for positive emotions assessed trait properties rather than the more relevant state properties. Given the initial evidence that

practice with the diffuse abdominal attentional stance has behavioral effects similar to those of MBSR practice, future research should use a randomized controlled trial study design with a larger and more diverse population to confirm these initial results, and examine mechanism.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12671-025-02563-2.

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Author Contribution All authors contributed to the study conception and design. Material preparation and data collection were performed by Glenn Hartelius, Dan Haldeman, and Marie Sester. Data analysis was performed by Glenn Hartelius and Lora Likova. Statistical analysis was performed by Christopher Tyler. The first draft of the manuscript was written by Glenn Hartelius, and all authors commented on the previous version of the manuscript. All authors read and approved the final manuscript.

Data Availability Study data are available from the corresponding author on request.

Declarations

Ethics Approval Approval was obtained from the ethics committee of the California Institute of Integral Studies. The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

Informed Consent Informed consent was obtained from all individual participants included in the study. The study contains no personally identifying information.

Conflict of Interest Author Hartelius is Director of the Attention Strategies Institute, a 501(c)3 non-profit dedicated to research and education that includes in its scope the attentional stance exercise tested in this study; he is co-author of a book describing this process. The other authors declare no financial or non-financial interests.

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