

The effect of a short mindfulness meditation practice on positive mental health: Self-transcendence as a mediating process

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Abstract: In two randomized controlled trials, we tested the effect of two attentional mindfulness meditation practices on positive mental health. We hypothesized that attentional meditation would increase various positive emotions (gratitude, interest, hope, pride, elevation, and awe) via three processes induced by mindfulness (body awareness, meta-awareness, and self-transcendence) and that positive self-transcendent emotions would in turn increase positive mental health (well-being and inner peace). This hypothesis was tested in two randomized online experiments. Participants were assigned to either a body scan meditation, a breath meditation, or a condition in which they listened to a story (active control). Various positive emotions, mindfulness-induced processes, and well-being/inner peace were assessed with self-reports. Experiment 1 (n = 166) revealed that practicing a 21-min body scan or breath meditation significantly increased positive emotions (in particular, elevation, gratitude, and pride) and that self-transcendence significantly mediated that effect. Experiment 2 (n = 127) replicated these findings in regard to positive emotions with a shorter, 11-min practice and revealed that two self-transcendent positive emotions (elevation and gratitude), but not pride—a more self-centered positive emotion—significantly mediated the effect of attentional meditation practice on well-being and inner peace. The implications of these results are discussed.

Keywords: mindfulness meditation; positive emotion; authentic happiness; self-transcendence; meta-awareness; body awareness; gratitude; elevation; pride

1. Introduction

A large number of studies have revealed that the practice of mindfulness meditation can reduce somatic as well as psychological disorders (e.g., Khoury et al., 2015). However, as Coo and Salanova (2018) pointed out, relatively little attention has been allocated to whether meditation practice can also improve aspects of positive mental health, such as well-being and inner peace (Dambrun et al., 2011, 2012). Furthermore, the processes by which meditation promotes these beneficial phenomena remain largely unexplored.

Mindfulness refers to either a disposition, a state, or a meditation practice. In all cases, it implies a state of awareness that results from intentionally paying attention to the present moment, without judging or reacting to the experience that unfolds moment by moment (Kabat-Zinn, 2003).

1.1 Dispositional mindfulness, mindfulness meditation, and happiness

Some studies have revealed a positive link between mindfulness and happiness. These studies fall into two categories: (a) those that have examined the relationship between different measures of dispositional and state mindfulness and happiness and (b) those that have tested the effect of mindfulness practice on changes in happiness. This second category includes studies that have tested the effect of a mindfulness-based intervention (MBI) occurring in a natural setting or a brief laboratory-based investigation of body scan and/or breathing meditation. In regard to dispositional and state mindfulness, different measures (Brown & Ryan, 2003; Baer et al., 2006; Blanke & Brose, 2017), are positively associated with different happiness scales (Bajaj et al., 2019; Blanke et al., 2018; Campos et al., 2016; Hanley et al., 2017; Harrington et al., 2016; Lundwall et al., 2019; Teal et al., 2019). Research that has evaluated the effect of various MBIs (including loving-kindness and compassion meditation programs) also reveals that the practice of mindfulness meditation over several weeks improves happiness, positive affect, life satisfaction, and subjective well-being (Coo & Salanova, 2018; Crowley et al., 2022; Ghadampour et al., 2018; Malboeuf-Hurtubise et al., 2018; Sarotina & Shchebetenko, 2020; Zandi et al., 2022; Zarifsanaiey et al., 2020). The few randomized laboratory studies are also consistent. The practice of a single meditation session, such as a body scan or breathing meditation, significantly increases subjective happiness (Dambrun, 2016; Dambrun et al., 2019; Droit-Volet et al., 2019). In summary, there is substantial evidence for the beneficial effect of mindfulness on happiness. One study revealed that this phenomenon is even noticeable to others: Choi et al. (2011) found that outside evaluators perceived meditators as looking happier than control or novice meditators. By what process does mindfulness promote happiness?

1.2 The processes at work

A few studies have begun to examine the processes that explain the relationship between mindfulness and happiness. In regard to the link between dispositional mindfulness and happiness, Bajaj et al. (2019) revealed that emotional stability and self-esteem both explain the relationship. Campos et al. (2016) found that the positive relationship between frequency of meditation practice and happiness is significantly mediated by one dimension of the Five Facets Mindfulness Questionnaire (FFMQ; i.e., observing) as well as by two dimensions of the Self-Compassion Scale–Short Form—that is, self-kindness and common humanity. Using the experience sampling method, Blanke et al. (2018) found that only nonjudgmental acceptance (a facet of the FFMQ) buffered the impact of daily hassles on affective well-being. Lundwall et al. (2019) examined the mediating function of self-regulation mechanisms in the relation between dispositional mindfulness and well-being. They found that reductions in cognitive emotion dysregulation (i.e., self-blame, rumination and catastrophizing) and an improvement in goal-directed self-regulation significantly mediated the relationship between the FFMQ and subjective well-being via a reduction of perceived stress. In regard to the mechanisms involved in the effect of MBIs on mental health, a meta-analysis by Gu et al. (2015) indicated that the majority of studies have focused on negative mental health measures (depression, anxiety, stress, distress, negative affect) and that very few have focused on the positive dimensions of mental health, with the exception of a study of quality of life and positive affect (Nyklicek & Kuijpers, 2008). In this study, mindfulness-based stress reduction was found to improve quality of life, and an increase in self-reported mindfulness mediated this effect. Finally, concerning randomized laboratory studies, the practice of a short, 21-min meditation has been found to increase happiness via a reduction in self salience (Dambrun, 2016) and an increase in oneness (Dambrun et al., 2019). There are several indications that certain positive emotions, in particular, self-transcendent ones, may also

play a role in the increased happiness associated with meditation practice, but studies of this phenomenon are quite rare.

1.3 Practice of mindfulness meditation and positive emotions

The *broaden-and-build theory* of positive emotions proposes that positive emotions cause an attentional broadening that promotes new thoughts, activities, and social relationships (Fredrickson, 2013). In turn, this effect results in the building of enduring personal resources (e.g., social support, resilience) that improve health, creating an upward spiral. Fredrickson (2013) proposed 10 core positive emotions, each with specific thought–action tendencies and that foster personal enduring resources. Several studies have examined the effect of loving–kindness and compassion meditation on positive emotions. A meta-analysis of 24 empirical studies found small to large effect sizes of this type of meditation on immediate or daily positive emotions (Zeng et al., 2015). However, although few studies have compared mindfulness meditation with loving–kindness meditation, Fredrickson et al. (2017) found that daily positive emotions significantly increased after a 6-wk practice of both types of meditation. Additional analyses also revealed significant dose–response relationships between duration/frequency of meditation practice and positive emotions. The within-person dose-response relationship was stronger for loving-kindness meditation than for mindfulness meditation. Mindfulness-to-meaning theory (Garland et al., 2015) suggests that mindfulness meditation improves well-being through the processes of decentering and positive reappraisal, which produce positive emotions that can be further amplified through *savoring*—the intentional practice of focusing attention on positive experience. An extension of Fredrickson’s broaden-and-build theory proposes that loving–kindness meditation improves well-being through the social psychological processes of focusing on the other and resonating positivity between and among individuals (Fredrickson, 2016).

During a meditation program that lasts several weeks, many variables may come into play in the psychological phenomena observed, and it is sometimes difficult to identify the mechanisms solely as a result of the meditation practice (Goldberg et al., 2016). It may be useful and complementary to conduct studies with protocols that allow for maximum control over the nature of the effects observed. With this in mind, we conducted two experiments to test the effect of a single mindfulness practice on novices. The purpose was to understand what happens, in term of emotion, during a single mindfulness meditation practice for a neophyte, and through which psychological processes mindfulness meditation increases positive emotions. For this first set of experiments, we wanted to examine which positive emotions are generated by the practice of a single meditation session and which of these emotions are most likely to promote well-being and inner peace. Of the 10 core positive emotions proposed by Fredrickson (2013), several appear to be impacted during the practice of a meditation session (e.g., pride, gratitude, elevation, hope, awe). According to Fredrickson, the discovery of mindfulness could be a source of inspiration and elevation. By reconnecting to one’s bodily sensations, viewing one’s mental manifestations as transient events through decentering, and experiencing self-transcendence, the practice of meditation may be able to encourage personal growth by eliciting elevation and hope. A sense of pride in undertaking and successfully implementing the challenging practice of meditation might also emerge, and mastery of this new practice might lead to the perception that one has received a gift or benefit, which would promote gratitude. When the experience of the practice is ecstatic—causing a peak experience of oneness, for example—some people may feel awe. Could these positive emotions promote positive mental health?

1.4 The status of positive emotions and their effect on positive mental health

Some positive emotions are known to promote positive mental health (Alexander et al., 2021). These include hope/optimism (Alarcon et al., 2013), awe (Zhao et al., 2019), gratitude (Portocarrero et al., 2020), curiosity (Wang & Li, 2015), and inspiration/elevation (Yuan, 2015). However, as we will see, other emotions, such as pride, may have less beneficial effects. Not all positive emotions have the same status (Stellar et al., 2017). Some are considered self-transcendent positive emotions (e.g. elevation, gratitude, awe; Yaden et al., 2017), whereas others are more self-centered in nature (e.g., pride, in particular, hubristic pride; Tracy & Robins, 2007; Tracy et al., 2011). According to the *self-centeredness/selflessness happiness model* (Dambrun & Ricard, 2011), only self-transcendent positive emotions should promote authentic and lasting happiness (i.e., well-being and inner peace). On the other hand, more self-centered positive emotions, such as pride, which has been conceptualized as an afflictive affect, should instead promote transitory pleasures, but not lasting happiness. We therefore assessed self-transcendent and more self-centered positive emotions, with the prediction that only the former would significantly mediate the effect of mindfulness practice on authentic happiness. We also measured a more neutral positive emotion regarding the transcendence dimension—curiosity—with the prediction that, despite its positive valence, it should not be promoted more by meditation practice than by an active control practice of a similar interest level. The prediction concerning hope is less clear because it could just as easily be promoted by a transcendence effect as by a more self-interest-related effect. Thus, hope should not play a major role in explaining the effects of mindfulness practice on positive mental health. In any case, if some positive emotions are triggered, and in turn promote authentic happiness (Dambrun et al., 2011, 2012), this could instigate an upward spiral whereby people will engage in the practice and sustainably improve their mental health. Now we have to see through which psychological processes mindfulness meditation can increase positive emotions.

1.5 Mindfulness-induced processes and positive emotions

The practice of mindfulness meditation generates different psychological phenomena. First, it increases body awareness (Hölzel et al., 2011; Treves et al., 2019). For example, in body scan meditation, practitioners are invited to be aware of different areas of their own body. In breath meditation, the practitioner may probe the areas involved in the breath and its path (e.g., nostrils, nose, throat, chest, abdomen). Another process induced by meditation practice is decentering via meta-awareness. *Meta-awareness* is a cognitive function that allows one to be aware of the contents of one's consciousness (e.g., thoughts, feelings, perceptions) as well as the process or field of awareness in which these mental contents exist. Meta-awareness is thought to enable *decentering* (Dahl et al., 2015), which involves observing thoughts and emotions as temporary manifestations in the present moment, without judging or reacting. This mechanism is involved in mindfulness meditation and is known to be an active ingredient in reducing anxiety, for example (Hoge et al., 2015). Finally, research has shown that mindfulness meditation can promote self-transcendence by reducing self-centeredness and increasing oneness and the extension of the self (Dambrun, 2016, 2019; Hanley et al., 2020). These processes are presented here separately, but there may be some degree of overlap. For example, meditation practice has been shown to promote states of self-transcendence through decentering (Hanley, Dorjee, & Garland, 2020). A recent extension of mindfulness-to-meaning theory proposed that mindfulness may induce self-transcendent positive emotions by eliciting experiences of oneness between the self and the world (Garland & Fredrickson, 2019). Hypothetically, each of these three processes (body awareness, decentering,

and self-transcendence) may serve as a mediating mechanism for the increases in positive emotions observed after mindfulness practice.

1.6 Summary

We tested the effect of two short mindfulness meditations (body scan and breathing meditation) on positive emotions in novices in two randomized experiments (i.e. RCT). Experiment 1 was designed to test the effect of meditation practices on various positive emotions such as interest, hope, pride, gratitude, elevation, and awe. In addition, we assessed body awareness, decentering/meta-awareness, and self-transcendence and predicted that these processes would mediate the effect of the short attentional meditation practice on positive emotions. In Experiment 2, we tested which positive emotions mediate the effect of mindfulness practice on positive mental health with the prediction that only self-transcendent positive emotions should mediate this effect.

2. Experiment 1

2.1 Method

2.1.1 Participants

One hundred sixty-six participants composed the sample (159 women and 9 men; $M_{\text{age}} = 19.5$ yr, $SD = 1.9$). All participants were undergraduate psychology students at the University of Clermont Auvergne in France and received course credit for their participation. Participants signed a formal agreement before taking part in this experiment. The study protocol was approved by IRB of University Clermont Auvergne (IRB00011540-2020-10). All participants have given informed consent to participate in the research.

2.1.2 Procedure

The experiment was programmed remotely on Qualtrics. Participants were asked to reserve a time slot over the next 5 days when they would not be disturbed. Between 6 and 12 hr before their time slot, participants received the web link to participate in the study on the Qualtrics site. After reading the information note and the consent form, participants were asked to sit at rest in front of their computers for 5 min while the program loaded. This was a pretext for having a reference baseline before participants filled out the first questionnaire about their emotional state and various perceptions during the wait. Then, each participant had to answer the first questionnaire before listening an audio tape recording of a 21-min experimental condition. At the end of the audio recording, the participant was asked to answer the questionnaire again to assess their emotional state and various perceptions during the practice. Thus, we were able to compare the self-reports during practice with those completed while waiting.

The participants were randomly assigned to a body scan meditation condition ($n = 52$), a breath meditation condition ($n = 58$), or a story condition ($n = 56$). During the practice, participants were instructed to lie on a mat on the floor with their eyes closed and, if possible, with headphones on. In the body scan, participants were asked to focus their attention on the different parts of the body sequentially (e.g., arm, hand, finger) and then to the whole body. In the breath meditation condition, the participants were asked to focus their attention on their breathing (e.g., inhaling, exhaling). In the active listening control condition, they listened to a 21-min audio recording of a Grimm Brothers story ("Jean de Fer").

Remote administration on Qualtrics allowed this study to be double-blind; neither the participants nor the experimenter were informed of the experimental condition which was automatically and randomly assigned by Qualtrics.

2.1.3 Materials

Each construct was assessed twice (before and after the listening session) using a visual analogue scale that ranged from 0 to 100. Participants were asked to respond by indicating how they had felt while they waited or listened. The reliability of the scales was assessed using Cronbach's α .

Positive emotions. Of the 10 positive emotions proposed by Fredrickson (2013), we assessed six: gratitude, interest, hope, pride, elevation, and awe. Each emotion was assessed using three items. We used the modified Differential Emotion Scale (Fredrickson et al., 2003): gratitude (grateful, appreciative, thankful; $\alpha_{\text{Time 1}} = .73$, $\alpha_{\text{Time 2}} = .85$), interest (interested, alert, curious; $\alpha_{\text{Time 1}} = .69$, $\alpha_{\text{Time 2}} = .73$), hope (hopeful, optimistic, encouraged; $\alpha_{\text{Time 1}} = .74$, $\alpha_{\text{Time 2}} = .90$), pride (proud, confident, self-assured; $\alpha_{\text{Time 1}} = .75$, $\alpha_{\text{Time 2}} = .85$), elevation (inspired, uplifted, elevated; $\alpha_{\text{Time 1}} = .76$, $\alpha_{\text{Time 2}} = .88$), and awe (awe, wonder, amazement; $\alpha_{\text{Time 1}} = .82$, $\alpha_{\text{Time 2}} = .90$). Higher scores indicated greater positive emotions (18 items; $\alpha_{\text{Time 1}} = .92$, $\alpha_{\text{Time 2}} = .96$). In the statistical analyses, we used a total positive emotion score and the means for each type of emotion.

Body awareness. On the basis of the Mehling et al.'s (2009) review of self-report measures of body awareness, in which "perceived body sensation" emerged as the first key dimension of the body awareness construct, we assessed body awareness using the two following items: (1) "I was aware of my body" and (2) "I was aware of all my sensations." Higher scores indicated greater body awareness ($\alpha_{\text{Time 1}} = .80$, $\alpha_{\text{Time 2}} = .86$).

Meta-awareness/decentering. Two items assessed meta-awareness/decentering ("I was in a 'mental posture' from which I could observe the things that were happening in me (example: thoughts, emotions, sensations)" and "I could observe things happening in my consciousness"). These two items were inspired by the meta-awareness dimension of the scale developed by Hanley et al. (2020). Higher scores indicated greater meta-awareness/decentering ($\alpha_{\text{Time 1}} = .71$, $\alpha_{\text{Time 2}} = .86$).

Self-transcendence. Three items from the Francis and Loudon (2000) scale of mystical orientation were used to assess oneness. Three items that stemmed from the oneness component were used (e.g., "sensing the unity in all things"). Higher scores indicated greater self-transcendence ($\alpha_{\text{Time 1}} = .58$, $\alpha_{\text{Time 2}} = .85$).

Control variables. After listening to the audio tape, participants were asked to indicate whether or not they had been disturbed while listening (1 = *not at all*; 2 = *yes, a little*; 3 = *yes, a lot*), and how seriously they had listened to the audio tape (range: 0 = *not seriously at all* to 100 = *very seriously*). In addition, at the end of the second questionnaire participants were asked whether or not they had used headphones during the listening (0 = no, 1 = yes).

Sociodemographics. Age and gender were requested at the end of the second questionnaire.

2.2 Results

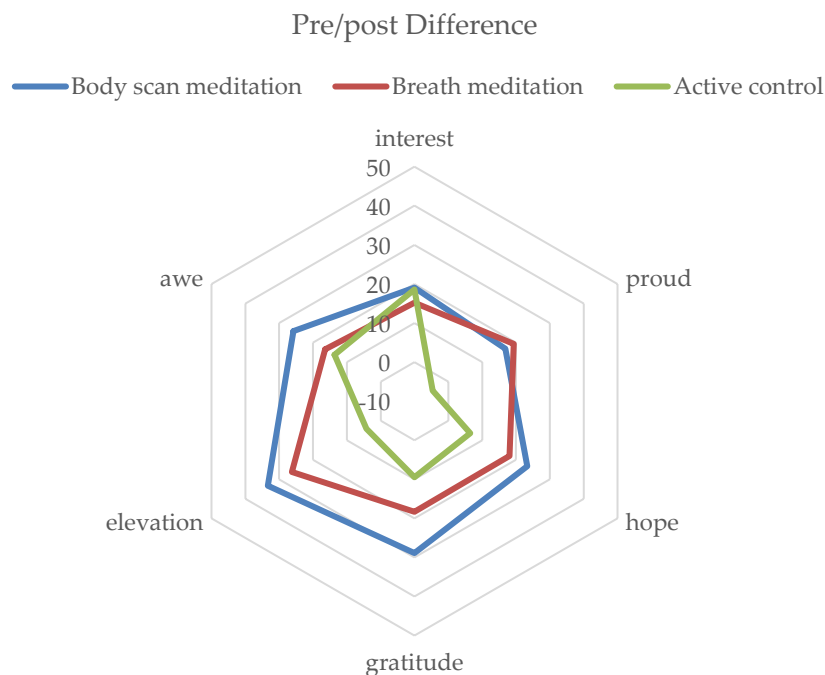
2.2.1 Power analysis

Based on the meta-analysis of the psychological effects of meditation (Sedlmeier et al., 2012), which found a medium average effect on positive emotions ($r = 0.28$) and well-being ($r = 0.31$), a power analysis was conducted using a medium effect size ($\eta^2_p = 0.06$; $f = 0.25$). The results showed a total sample of 66 participants was required to achieve a power of 0.95.

2.2.2 Positive emotions

We performed a 3 (experimental condition: body scan vs. breath meditation vs. listening a tale) \times 2 (time: before or after the listening) analysis of variance (ANOVA) on the positive emotions scores. As expected, this analysis revealed a significant Time \times Condition interaction, $F(1, 163) = 9.28, p < .001, \eta_p^2 = .10$. The increase in positive emotions was significantly greater in the body scan ($M_{diff} = 24.55; p_{holm} < .001, \text{Cohen's } d = 0.81$) and the breath meditation condition ($M_{diff} = 18.93; p_{holm} < .01, \text{Cohen's } d = 0.54$) than in the active control condition ($M_{diff} = 7.95$). There was no significant difference between the two meditation conditions ($p_{holm} > .10$). Figure 1 distinctly presents the results for each type of positive emotion.

Figure 1. Effects of attentional meditation practices on various positive emotions (Experiment 1)



Pride. The interaction effect between time and condition on pride was significant, $F(1, 163) = 18.3, p < .001, \eta_p^2 = .18$. The increase in pride was significantly greater in the body scan ($M_{diff} = 16.84; p_{holm} < .001, \text{Cohen's } d = 0.93$) and the breath meditation conditions ($M_{diff} = 19.33; p_{holm} < .001, \text{Cohen's } d = 1.04$) than in the active control condition ($M_{diff} = -4.67$). There were no other significant differences.

Gratitude. The ANOVA also revealed a significant interaction effect of gratitude, $F(1, 163) = 9.01, p < .001, \eta_p^2 = .10$. The increase in gratitude was significantly greater in the body scan ($M_{diff} = 28.89; p_{holm} < .001, \text{Cohen's } d = 0.82$) and the breath meditation conditions ($M_{diff} = 18.32; p_{holm} < .05, \text{Cohen's } d = 0.37$) than in the active control condition ($M_{diff} = 9.48$). The increase in gratitude also was significantly greater in the body scan condition than in the breath meditation condition ($p_{holm} < .05, \text{Cohen's } d = 0.45$).

Elevation. The interaction term also was significant in the case of elevation, $F(1, 163) = 21.2, p < .001, \eta_p^2 = .21$. The increase in elevation was significantly greater in the body scan ($M_{diff} = 33.35; p_{holm} < .001, \text{Cohen's } d = 1.19$) and the breath meditation conditions ($M_{diff} = 26.24; p_{holm} < .001, \text{Cohen's } d = 0.90$) than in the active control condition ($M_{diff} = 4.20$). There were no other significant differences.

Awe. The interaction effect on awe was significant, $F(1, 163) = 3.50, p = .032, \eta_p^2 = .04$. The increase in awe was significantly greater only in the body scan condition ($M_{\text{diff}} = 25.8; p_{\text{holm}} = .036$, Cohen's $d = 0.49$) than in the active control condition ($M_{\text{diff}} = 13.6$). The increase in gratitude in the breath meditation condition did not differ from the two other conditions ($p_{\text{holm}} > .10$).

Interest. The ANOVA revealed a nonsignificant Time \times Condition interaction, $F(2, 124) = 0.35, p > .71, \eta_p^2 < .01$.

Hope. The interaction effect also was significant in the case of hope, $F(1, 163) = 5.32, p < .01, \eta_p^2 = .06$. The increase in hope was significantly greater in the body scan ($M_{\text{diff}} = 23.33; p_{\text{holm}} < .01$, Cohen's $d = 0.61$) condition and marginally greater in the breath meditation condition ($M_{\text{diff}} = 18.04; p_{\text{holm}} = .054$, Cohen's $d = 0.42$) than in the active control condition ($M_{\text{diff}} = 6.47$). There were no other significant differences.

2.2.3 Potential mediators

Body awareness. We performed a 3 (condition) \times 2 (time) ANOVA on body awareness. As expected, it revealed a significant Time \times Condition interaction, $F(2, 163) = 26.3, p < .001, \eta_p^2 = .24$. The increase in body awareness was significantly greater in the body scan ($M_{\text{diff}} = +11.50; p_{\text{holm}} < .001$, Cohen's $d = 1.26$) and the breath meditation conditions ($M_{\text{diff}} = +7.21; p_{\text{holm}} < .001$, Cohen's $d = 1.13$) than in the active control condition ($M_{\text{diff}} = -24.87$). There was no significant difference between the two meditation conditions ($p_{\text{holm}} > .10$).

Meta-awareness/decentering. The interaction effect on meta-awareness/decentering also was significant, $F(2, 163) = 8.94, p < .001, \eta_p^2 = .10$. The increase in meta-awareness/decentering was significantly greater in the body scan ($M_{\text{diff}} = 11.51; p_{\text{holm}} < .001$, Cohen's $d = 0.75$) and the breath meditation conditions ($M_{\text{diff}} = 7.91; p_{\text{holm}} = .002$, Cohen's $d = 0.64$) than in the active control condition ($M_{\text{diff}} = -12.94$). There was no significant difference between the two meditation conditions ($p_{\text{holm}} > .10$).

Self-transcendence. The interaction effect on self-transcendence (i.e., oneness) also was significant, $F(2, 163) = 9.70, p < .001, \eta_p^2 = .11$. The increase in self-transcendence was significantly greater in the body scan ($M_{\text{diff}} = 18.19; p_{\text{holm}} < .001$, Cohen's $d = 0.85$) and the breath meditation conditions ($M_{\text{diff}} = 8.77; p_{\text{holm}} < .05$, Cohen's $d = 0.38$) than in the active control condition ($M_{\text{diff}} = 1.26$). The increase in the body scan condition was significantly greater than the increase in the breath meditation condition ($p_{\text{holm}} = .03$, Cohen's $d = 0.47$).

2.2.4 Relationships between potential mediators and positive emotions

We computed Pearson correlations between change in body awareness, meta-awareness/decentering, self-transcendence, and positive emotions. The four variables were significantly and positively related to each other. The increase in body awareness was positively related to the increase in meta-awareness/decentering ($r = .50, p < .001$), self-transcendence ($r = .21, p < .01$), and positive emotions ($r = .23, p < .01$). The increase in meta-awareness/decentering also was positively related to the increase in self-transcendence ($r = .26, p < .001$) and positive emotions ($r = .22, p < .01$). Finally, the increase in self-transcendence was strongly related to the increase in positive emotions ($r = .51, p < .001$).

2.2.5 Do body awareness, meta-awareness/decentering, and self-transcendence mediate the effect of attentional meditation practice on positive emotions?

We tested the multiple mediators' model (i.e., attentional meditation practice \rightarrow body awareness/meta-awareness–decentering/self-transcendence \rightarrow positive emotions) by following

the procedure advocated by Preacher and Hayes (2004). We used PROCESS (Version 3.5) for SPSS. We selected the following specifications: Model No. 4, 5,000 bootstrap samples, and 95% confidence intervals (CIs). A contrast was computed to test the effect of attentional meditation practice (i.e., body scan condition = +1, breathing meditation condition = +1, active control condition = -2). When the three mediators were statistically controlled for, the effect of attentional meditation practice on positive emotions became marginally significant (direct effect: $b = 2.26$, $SE = 1.17$, $p = .06$, $CI [-0.06, 4.58]$; total effect: $b = 4.54$, $SE = 1.12$, $p < .001$, $CI [2.33, 6.76]$). The mediation was significant in the case of self-transcendence (indirect effect: $b = 1.83$, $SE = 0.60$, $CI [0.73, 3.12]$), but not in the case of body awareness (indirect effect: $b = 0.29$, $SE = 0.60$, $CI [-0.96, 1.36]$) and meta-awareness/decentering (indirect effect: $b = 0.16$, $SE = 0.38$, $CI [-0.62, 0.90]$). Thus, only self-transcendence significantly mediated the effect of the attentional meditation practice on positive emotions (see Table 1). We also found support for the alternative model, in which positive emotions mediate the effect of meditation practice on self-transcendence, and for Hanley et al.'s (2020) model, in which meta-awareness/decentering mediates the effect of mindfulness practice on self-transcendence (see Table 1).

Table 1. Indirect, direct, and total effects of multiple mediation models (Experiment 1)

	Indirect effect	Direct effect	Total effect
<i>Predicted multiple mediators' model</i>			
Meditation > Body awareness > Positive emotions	$b = 0.29$ $CI: -0.96, 1.36$	$b = 2.26$ $CI: -0.06, 4.58$	$b = 4.54$ $CI: 2.33, 6.76$
> Meta-awareness/ decentering > Positive emotions	$b = 0.16$ $CI: -0.62, 0.90$		
> Self- transcendence > Positive emotions	$b = 1.83$ $CI: 0.73, 3.12$		
<i>Alternative Models</i>			
Alternative model 1:			
Meditation > Positive emotions > Body awareness	$b = 0.59$ $CI: -0.56, 1.80$	$b = 10.78$ $CI: 7.52, 14.04$	$b = 11.37$ $CI: 8.26, 14.48$
Alternative model 2:			
Meditation > Positive emotions > Meta-awareness/ decentering	$b = 0.00$ $CI: -0.05, 0.05$	$b = 0.35$ $CI: 0.01, 0.69$	$b = 0.35$ $CI: 0.02, 0.69$
Alternative model 3:			
Meditation > Positive emotions > Self-transcendence	$b = 2.08$ $CI: 0.98, 3.44$	$b = 1.90$ $CI: -0.14, 3.95$	$b = 3.99$ $CI: 1.80, 6.18$
Test of Hanley et al. (2020) model with the addition of body awareness			
Meditation > Meta-awareness/ decentering > Self-transcendence	$b = 0.86$ $CI: 0.16, 1.78$	$b = 3.01$ $CI: 0.51, 5.21$	$b = 3.99$ $CI: 1.80, 6.18$
> Body awareness > Self-transcendence	$b = 0.12$ $CI: -1.34, 1.55$		

Note. Contrast "Meditation": Body Scan = 1; Breath meditation = 1; control = -2. Models supported by the data are indicated with a grey background. b = unstandardized beta coefficient; CI = 95% Confidence Interval (lower and upper bound).

2.2.6 Additional analyses with control variables

Because of the home-based nature of the experiment, we wanted to control for the potential effects of three potential confounding variables: (a) whether the participants had been disturbed

during the practice, (b) the degree to which the participants thought they had listened to the audio seriously, and (c) whether they had listened to the audio tape with or without headphones.

First, concerning the descriptive variables, we noted that participants reported a low level of disturbance during the experiment ($M = 1.27/3$; $SD = 0.46$), and a high level of seriousness ($M = 84.8/100$; $SD = 16.8$). Of all participants, 44.6% used headphones. Second, we examined whether these scores varied according to the experimental condition. Perceived disturbance ($\chi^2(2) = 8.34$, $p = .02$) and perceived seriousness differed significantly between conditions, $F(2, 162) = 5.36$, $p < .01$. Participants reported being significantly more disturbed during the listening in the breath meditation condition ($M = 1.41/3$) than in the body scan condition ($M = 1.17/3$; $W = 3.67$, $p = .03$). Participants also reported performing the practice more seriously in the body scan condition ($M = 90.8/100$) than in the breath meditation ($M = 80.9/100$; $p_{\text{holm}} < .01$) and control conditions ($M = 83.2/100$; $p_{\text{holm}} = .04$). On the other hand, the proportion of participants who used headphones was similar between conditions, $\chi^2(2) = 3.93$, $p > .14$. Third, we examined the relationships between our control variables and the increase in positive emotions during the practice. Of the three control variables, only perceived seriousness was positively and significantly related to the increase in positive emotions (Spearman $\rho = .36$, $p < .001$). Finally, we performed a 3 (experimental condition) \times 2 (time) ANOVA on the positive emotions scores with the measure of perceived seriousness as a covariate. The interaction effect between condition and time on positive emotions remained significant and revealed the same basic findings, $F(1, 161) = 7.40$, $p < .001$, $\eta_p^2 = .08$.

2.3 Discussion

This first experiment indicates that a short mindfulness meditation practice increases, at least temporarily, positive emotions. The results also clarify that focusing on one's body or breathing is more related to some positive emotions than focusing on a story; specifically, pride, gratitude, elevation, and hope increased during both meditation conditions, and awe increased only during the body scan meditation. The increase in gratitude also was greater during the body scan meditation than the breathing meditation practice. This confirms our hypothesis that a meditation practice can enhance self-transcendent positive emotions such as gratitude, elevation, and awe, but also more self-centered positive emotions, such as pride. This is consistent with work suggesting that meditation practice, in particular among novices, can have contradictory effects in terms of self-centeredness versus selflessness. For example, research has shown that meditation practice can promote self-transcendence (for a recent review, see Britton et al., 2021) as well as phenomena of self-enhancement (Gebauer et al., 2018). It is possible that different positive emotions underlie these seemingly opposite phenomena; self-transcendent positive emotions in the case of the former and more self-centered positive emotions in the case of the latter.

The fact that we did not find an effect on curiosity suggests that meditation practice did not stimulate participants' curiosity more than listening to the story did. The results for the potential confounding variables also reveal that the degree of disturbance during practice/listening, the degree of seriousness with which the practice/listening was done, and whether or not headphones were used cannot explain the observed effects.

In this experiment we also looked at the mediating effect of three mechanisms that were present in mindfulness meditation. First, in a replication of previous findings, we found that a short practice of mindfulness meditation significantly improved body awareness, meta-awareness/decentration, and self-transcendence. Although we did not find support for a mediating role of body awareness and meta-awareness in the effect of meditation practice on positive emotions, self-transcendence significantly mediated this effect. This suggests that the

increase in positive emotions, and potentially the well-being that could be associated with it, during the practice of a meditation session may co-occur with a phenomenon of self-transcendence (Dambrun, 2016; Dambrun et al., 2019, 2023; Hanley et al., 2020). In Experiment 2, we continued in this direction with the hypothesis that self-transcendent positive emotions, but not self-centered positive emotions such as pride, would mediate the effect of a short mindfulness practice on well-being and inner peace.

3. Experiment 2

3.1 Method

3.1.1 Participants

One hundred twenty-seven participants composed the sample (113 women and 13 men; $M_{\text{age}} = 18.9$ yr, $SD = 1.8$). All participants were undergraduate psychology students at the University of Clermont Auvergne and received course credit for their participation. Participants signed a formal agreement before taking part in this experiment. The study protocol was approved by IRB of University Clermont Auvergne (IRB00011540-2022-08). All participants have given informed consent to participate in the research.

3.1.2 Procedure

The procedure was similar to that of Experiment 1, with the exception that the audio tape duration was shorter (11 min instead of 21), and there was no baseline questionnaire. The experiment also was programmed remotely on Qualtrics following the same procedure. After reading the information note and the consent form, participants were asked to listen an audio recording of the experimental induction for 11 min. At the end of the audio recording, they were asked to answer a questionnaire to assess their emotional state and level of happiness during the practice.

The participants were randomly assigned to a body scan meditation condition ($n = 42$), a breath meditation condition ($n = 42$), or a story condition ($n = 43$). During the practice, participants were instructed to sit on a chair with their eyes closed and, if possible, with headphones on. Unlike in Experiment 1, in which participants were asked to lie on the floor, in this study the instructions for the audio tapes were adapted for listening/practicing in a seated position. In the body scan condition, participants were asked to focus their attention on the different parts of the body sequentially (feet, toes, calves, thighs, all along the spine, chest, shoulders, arms, hands, and different parts of the face). In the breath meditation condition the participants were asked to focus their attention on their breathing (e.g., inhaling, exhaling). In the active listening control condition, they listened to a 11-min audio recording of a Hans Christian Andersen story (“The Snowman”).

3.1.3 Materials

Positive emotions. We assessed the same six positive emotions as in Experiment 1 with the modified Differential Emotion Scale. Participants were asked to respond by indicating how they felt while listening. After listening, each emotion was assessed with three items: gratitude (grateful, appreciative, thankful; $\alpha = .77$), interest (interested, alert, curious; $\alpha = .69$), hope (hopeful, optimistic, encouraged; $\alpha = .83$), pride (proud, confident, self-assured; $\alpha = .81$), elevation (inspired, uplifted, elevated; $\alpha = .83$), and awe (awe, wonder, amazement; $\alpha = .78$). Items were rated on a visual analogue scale that ranged from 0 to 10; higher scores indicated greater positive emotions during the practice. The reliability of the full scale was satisfactory (18 items; $\alpha = .93$).

Positive mental health. We assessed positive mental health with two items (well-being and inner peace) from the Subjective Authentic–Durable Happiness Scale (Dambrun et al., 2012). Participants were asked to indicate their feelings during the listening using a visual analogue scale that ranged from 0 to 10; higher scores indicated greater happiness. We computed a composite positive mental health score by averaging responses to the two well-being and inner peace items. The reliability of the two-item scale was satisfactory ($\alpha = .85$).

Control variables. The exact same control variables as in Experiment 1 were measured (i.e., perceived disturbance during the listening, perceived seriousness, and headphone use). The scales were identical to those in Experiment 1 except for the measure of seriousness, which could range not from 0 to 100 but from 0 to 10.

Sociodemographics. Age and gender were requested at the end of the questionnaire.

3.2 Results

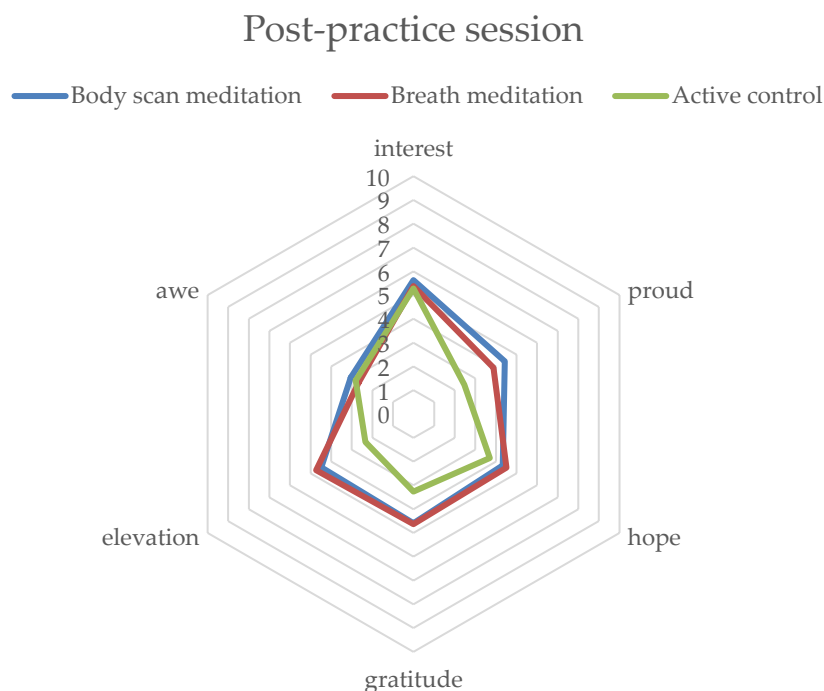
3.2.1 Power analysis

Based on the effect size of the 21-min practice exercise on positive emotions observed in Experiment 1 (i.e. $\eta^2_p = 0.10$; $f = 0.33$), a power analysis revealed that a total sample of 39 participants was required to achieve a power of 0.95.

3.2.2 Positive emotions

We performed a 3 (experimental condition: body scan vs. breath meditation vs. listening a tale) ANOVA on the positive emotions scores. As expected, it revealed a significant effect of condition, $F(2, 124) = 4.21, p = .02, \eta^2_p = .06$. Positive emotion scores were significantly greater in the body scan ($M = 4.42$; $p_{\text{holm}} = .03$, Cohen’s $d = 0.57$) and the breath meditation conditions ($M = 4.30$; $p_{\text{holm}} < .05$, Cohen’s $d = 0.51$) than in the active control condition ($M = 3.36$). There was no significant difference between the two conditions of meditation ($p_{\text{holm}} > .76$). Figure 2 distinctly presents the results for each type of positive emotion.

Figure 2. Effects of attentional meditation practices on various positive emotions (Experiment 2)



Pride. The main effect of condition on pride was significant, $F(2, 124) = 9.25, p < .001, \eta_p^2 = .13$. Pride was significantly greater in the body scan ($M = 4.43; p_{\text{holm}} < .001$, Cohen's $d = 0.90$) and the breath meditation conditions ($M = 3.88; p_{\text{holm}} < .01$, Cohen's $d = 0.65$) than in the active control condition ($M = 2.47$).

Gratitude. The main effect of condition on gratitude was significant, $F(2, 124) = 4.84, p < .01, \eta_p^2 = .07$. Gratitude was significantly greater in the body scan ($M = 4.59; p_{\text{holm}} = .021$, Cohen's $d = 0.57$) and the breath meditation conditions ($M = 4.63; p_{\text{holm}} = .021$, Cohen's $d = 0.59$) than in the active control condition ($M = 3.26$).

Elevation. The main effect of condition also was significant in the case of elevation, $F(2, 124) = 9.64, p < .001, \eta_p^2 = .14$. Elevation was significantly greater in the body scan ($M = 4.48; p_{\text{holm}} < .001$, Cohen's $d = 0.77$) and the breath meditation conditions ($M = 4.73; p_{\text{holm}} < .001$, Cohen's $d = 0.87$) than in the active control condition ($M_{\text{diff}} = M = 2.64$).

Awe. In the case of awe, the effect of condition was not significant, $F(2, 124) = 0.42, p > .66, \eta_p^2 < .01$.

Interest. The effect of condition on interest was not significant, $F(2, 124) = 0.35, p > .71, \eta_p^2 < .01$.

Hope. For hope, the effect of condition was not significant, $F(2, 124) = 1.25, p > .29, \eta_p^2 = .02$.

3.2.3 Positive mental health: Well-being and inner peace

We performed a 3 (condition: body scan vs. breath meditation vs. listening a tale) \times ANOVA on the scores of well-being/inner-peace. As expected, this analysis revealed a significant effect of condition, $F(2, 124) = 7.38, p < .001, \eta_p^2 = .11$. Authentic happiness was significantly greater in the body scan ($M = 6.70; p_{\text{holm}} < .02$, Cohen's $d = 0.58$) and the breath meditation conditions ($M = 7.29; p_{\text{holm}} < .001$, Cohen's $d = 0.81$) than in the active control condition ($M = 5.17$). There was no significant difference between the two meditation conditions ($p_{\text{holm}} > .31$).

3.2.4 Do positive emotions mediate the effect of attentional meditation practice on positive mental health?

We computed Pearson correlations between positive emotions that were significantly affected by the experimental manipulation (i.e., gratitude, pride, and elevation) and the average score of well-being/inner peace. The three positive emotions were positively and significantly related to happiness (gratitude: $r = .60, p < .001$; pride: $r = .60, p < .001$; elevation: $r = .65, p < .001$). We then tested our predicted multiple mediators' model (i.e., attentional meditation practice \rightarrow gratitude/pride/elevation \rightarrow authentic happiness) by following the procedure advocated by Preacher and Hayes (2004). We used PROCESS (Version 3.5) for SPSS. We selected the following specifications: Model No. 4, 5,000 bootstrap samples, and 95% CIs.

We computed a contrast to test the effect of attentional meditation practice (i.e., body scan condition = +1; breathing meditation condition = +1; active control condition = -2). When the three positive emotions were statistically controlled for, the effect of attentional meditation practice on well-being/inner peace became nonsignificant (direct effect: $b = 0.02, SE = 0.22, p = .92, CI [-0.42, 0.47]$; total effect: $b = 0.76, SE = 0.28, p < .01, CI [0.21, 1.32]$). The mediation was significant in the case of elevation (indirect effect: $b = 0.43, SE = 0.17, CI [0.15, 0.82]$) and gratitude (indirect effect: $b = 0.24, SE = 0.11, CI [0.04, 0.49]$), but not in the case of pride (indirect effect: $b = 0.07, SE = 0.14, CI [-0.25, 0.35]$). Thus, elevation and gratitude—that is, self-transcendent positive emotions—significantly mediated the effect of the attentional meditation practice on well-being/inner peace (see Table 2). We did not find support for the alternative model, in which well-being/inner peace mediates the effect of meditation practice on elevation, gratitude, or pride (see Table 2).

Table 2. Indirect, direct, and total effects of predicted and alternative mediation models (Experiment 2)

	Indirect effect	Direct effect	Total effect
<i>Predicted Model</i>			
Meditation > Gratitude > Well-being/Inner-peace	$b = 0.24$ CI: 0.05, 0.50	$b = 0.02$ CI: -0.42, 0.47	$b = 0.76$ CI: -0.21, 1.32
> Proud > Well-being/Inner-peace	$b = 0.07$ CI: -0.24, 0.37		
> Elevation > Well-being/Inner-peace	$b = 0.43$ CI: 0.15, 0.84		
<i>Alternative Models</i>			
Alternative model 1:			
Meditation > Well-being/Inner-peace > Gratitude (controlling for proud and elevation)	$b = 0.00$ CI: -0.12, 0.14	$b = -0.07$ CI: -0.43, 0.30	$b = -0.07$ CI: -0.45, 0.32
Alternative model 2:			
Meditation > Well-being/Inner-peace > Proud (controlling for gratitude and elevation)	$b = 0.00$ CI: -0.05, 0.05	$b = 0.35$ CI: 0.01, 0.69	$b = 0.35$ CI: 0.02, 0.69
Alternative model 3:			
Meditation > Well-being/Inner-peace > Elevation (controlling for gratitude and proud)	$b = 0.03$ CI: -0.12, 0.08	$b = 0.16$ CI: -0.18, 0.50	$b = 0.19$ CI: -0.17, 0.56

Note. Contrast "Meditation": Body Scan = 1; Breath meditation = 1; control = -2. Models supported by the data are indicated with a grey background. b = unstandardized beta coefficient; CI = 95% Confidence Interval (lower and upper bound).

3.2.5 Additional analyses with control variables

As in Experiment 1, we wanted to control for the potential effects of perceived disturbance, seriousness, and headphones use. Regarding the descriptive variables, participants reported a low level of disturbance during the listening ($M = 1.20/3$, $SD = 0.40$) and a high level of seriousness ($M = 9/10$, $SD = 1.60$). Of all participants, 47.2% used headphones. We then examined whether these scores varied according to the experimental condition. Perceived disturbance was similar across the experimental conditions, $\chi^2(2) = 1.92$, $p > .38$. In regard to seriousness, participants reported performing the practice more seriously in the breath meditation condition ($M = 8.86/10$) than in the control condition ($M = 7.88/10$; $p_{\text{holm}} = .02$). The proportion of participants who used headphones varied across conditions, $\chi^2(2) = 7.22$, $p = .03$. Participants in the breath meditation condition used headphones more frequently than those in the body scan condition ($W = 3.70$, $p = .024$). We examined the relationships between our control variables, positive emotions and well-being/inner peace. Of the three control variables, only perceived seriousness was positively and significantly related to both positive emotions (Spearman $\rho = .20$, $p = .03$) and well-being/inner peace (Spearman $\rho = .38$, $p < .001$). Finally, we included perceived seriousness as a covariate in a series of analyses of covariance. Controlling for perceived seriousness, the main effect of experimental condition on positive emotions and well-being/inner peace remained marginally significant or significant: respectively, $F(2, 123) = 2.85$, $p = .061$, $\eta_p^2 = .04$, and $F(2, 123) = 4.43$, $p = .014$, $\eta_p^2 = .07$.

3.3 Discussion

Experiment 2 confirmed the results of Experiment 1 with a shorter, seated mediation. However, fewer positive emotions were significantly impacted by meditation practice (three out of six emotions in this experiment vs. five out of six in Experiment 1). Effect sizes were also smaller. This is consistent with a dose response between practice duration and positive emotions (Fredrickson et al., 2017). The three positive emotions that were significantly impacted by this

short, 11-min meditation were, in decreasing effect size order: elevation, pride, and gratitude. Awe and hope, which were significantly impacted in Experiment 1, were not improved in this second experiment.

As expected, and in a replication of previous findings (e.g., Dambrun, 2016, 2019), the short practice of both body-scan and breath meditation significantly increased well-being and inner peace compared with the control condition. The central hypothesis of a mediating effect of self-transcendent positive emotions on positive mental health was supported by the data. Indeed, the increase in elevation and gratitude significantly independently mediated the relationship between mindfulness practice and increased positive mental health. Furthermore, as expected, pride did not mediate this relation, and alternative models showed no mediating effect of well-being/inner peace on elevation, pride, and gratitude. Again, these results cannot be explained by the potentially confounding variables we controlled for. Thus, in a confirmation of Experiment 1, a process of self-transcendence seemed to be at work in the emergence of positive mental health linked to the practice of a mindfulness meditation session.

4. General discussion

These two experiments show that meditation practice can improve positive mental health. This is consistent with the existing literature, which reveals that dispositional mindfulness is positively related to positive mental health (Bajaj et al., 2019; Blanke et al., 2018) and with the observed effect of MBI on happiness (Coo & Salanova, 2018; Crowley et al., 2022). A few studies have already yielded similar results after a single meditation practice in the laboratory (Dambrun, 2016; Dambrun et al., 2019; Droit-Volet et al., 2019). The present research confirms this work by showing that even a short, 11-min meditation, at home, done by novices, increases the subjective level of short-term well-being and inner peace. On the basis of a complete state model of health (Keyes, 2005), it appears that the practice of meditation, in addition to reducing lowered well-being and psychiatric disorders (Goldberg et al., 2018), can also optimize psychological functioning and increase positive mental health (Koydemir et al., 2021).

Our two experiments also examined some of the mechanisms induced by meditation (i.e., body awareness, meta-awareness/decentering, and self-transcendence) and investigated the relationship between self-transcendent positive emotions and well-being/inner peace during meditation practice. The first experiment shows that the level of self-transcendence induced by meditation mediates the increase in positive emotions, and the second experiment shows that self-transcendent positive emotions (i.e., elevation and gratitude) mediate the relationship between meditation practice and increased well-being and inner peace. Neither increased body awareness nor increased meta-awareness/decentering appears to play a direct mediating role in positive emotions in this protocol. The impact of meta-awareness/decentering on negative emotions, stress, and anxiety is well known (Hoge et al., 2015). Garland et al. (2015), through mindfulness-to-meaning theory, explained that decentering from these emotions, sensations, and thoughts allows disidentification with one's thoughts and emotions. It seems that here, for novices who do a short meditation, feeling oneness, a marker of self-transcendence, explains the increase in positive emotions more than decentering oneself from one's own thoughts, sensations, or emotions. This is consistent with the study conducted by Dambrun et al. (2019), who found that oneness played a central mediating role in the effect on happiness of a single mindfulness meditation session. Hanley et al. (2020) proposed that meta-awareness/decentering mediates the effect of mindfulness on self-transcendence and found evidence for this model. We also found support for this mediational pathway in our data. Thus, decentering from thought and emotion probably affects happiness by eliciting self-transcendence. This finding may explain why meta-

awareness/decentering did not significantly mediate the effect of mindfulness practice on positive emotions when controlling for self-transcendence. Mindfulness-to-meaning theory proposes that decentered meta-awareness during meditation leads to blissful experiences of oneness that ultimately foster the temporary experiential dissolution of the subject–object dichotomy—the sine qua non of self-transcendence—which in turn promotes self-transcendent positive emotions and an enhanced sense of well-being.

Consistent with a pivotal role for self-transcendence, Experiment 2 reveals that self-transcendent positive emotions mediate the effect of meditation practice on well-being and inner peace. Pride, a more self-centered positive emotion, did not play a significant mediating role. Curiosity, hope, and awe also did not play a central role in the observed effect. Thus, it is not simply the positive valence of emotions that increase well-being and inner peace during meditation practice but also whether these emotions facilitate self-transcendence. According to the self-centeredness/selflessness happiness model, self-transcendent emotions elicited by meditation practice, such as elevation and gratitude, should promote positive mental health via a sense of harmony (Dambrun & Ricard, 2011; see also Dambrun et al., 2019). Future research may test this hypothesis.

Although body awareness is known to be increased during meditation (Treves et al., 2019), this variable does not appear to mediate the effects observed here. Dambrun et al. (2019) found that alteration of one's inner body experience significantly mediated the effect of meditation on self-transcendence. Although the modification of the inner body experience involves body awareness, these are two distinct variables. It is possible that it is not body awareness per se that triggers the phenomenon of self-transcendence during meditation but rather the experience of one's own body boundaries dissolving during meditation practice (Dambrun, 2016) and the spatial frame of reference extending beyond the physical body (Hanley et al., 2020).

Further studies need to be undertaken to determine the exact mechanisms in the chain that explain how mindfulness affects emotions and mental health. The mechanisms that explain the decrease in negative emotions may be different from the mechanisms that explain the increase in positive emotions (Keyes, 2005; Ryff et al., 2006). Thus, although the role of self-transcendence should be emphasized in the study of well-being and positive emotions, its role in relation to negative emotions remains unclear and deserves further investigation.

4.1 Limitations and future directions

This study has several limitations. The fact that our two samples were composed mostly of young French women studying psychology limits the scope of our results. This lack of diversity – of gender and ethnicity limits the generalizability of the findings to other populations. Additionally, the remote and controlled nature of the experiment may not accurately reflect the real-world conditions in which meditation practices typically occur. Despite the double-blind design, participants might have guessed the purpose of the study, particularly those in the meditation conditions, which could influence their responses. This potential for demand characteristics may threaten the internal validity of the study.

The intervention lasted only 21 minutes, which may not be sufficient to observe the long-term effects of meditation practices on positive emotions and other outcomes. Longer interventions might yield different results. The study measured outcomes immediately after the intervention, capturing only the immediate effects. The objective was indeed to experimentally capture the transient or state effects of meditation, sometimes referred to as a modified state. Of course, longitudinal follow-ups (such as mindfulness-based interventions) would be necessary to understand the lasting impact of meditation practice on self-transcendent emotions for example.

Although the study controlled for disturbances during practice, the seriousness of listening, and headphone use, other potential confounding variables, such as participants' prior experience with meditation, were not controlled. While this variable did not have an effect in similar previous studies (e.g., Dambrun et al., 2023), it would be preferable to control for it.

In order not to overload the participants, we opted to use short questionnaires. Several of our scales were composed of only a few visuo-analogical items (i.e. meta-awareness, body awareness, well-being). The psychometric quality of this type of instrument is not necessarily lower (Robins et al., 2001; Williams et al., 2010), but it would be helpful to replicate these results with complete and recognized scales.

In regard to the results on gratitude, elevation, and pride, the measures we used make interpretation difficult. It would be interesting if future research added a qualitative component to better identify the experience lived by the participants. For example, we do not know what type of gratitude they experienced the most during the meditation session (e.g., gratitude for themselves, gratitude for the organizers of the study, gratitude for the experience during the meditation, gratitude for life in general). On the basis of on the literature, we assumed that gratitude, elevation, and awe were self-transcendent emotions (Stellar et al., 2017; Yaden et al., 2017) and that pride was more a self-centered emotion (Dambrun et al., 2011; Tracy et al., 2007). This assumption is probably partly true, but it is important to explore this dichotomy further. For example, distinguishing and assessing both authentic and hubristic pride (Tracy et Robins, 2007; Tracy et al., 2011) would be informative. It is also possible that elevation can both promote self-transcendence, but at the same time feeling that one is improving could lead to a phenomenon of feeling superior, which is sometimes observed in mind–body practices such as yoga or meditation (Vonk et al., 2021), which might in turn evoke self-centeredness. More rigorous, well-controlled studies of meditation-induced positive emotions, and their relations to self-transcendence and psychological well-being, are needed.

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Conflict of interest statement

The authors report no conflicts of interest.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Author contributions statement

Michaël Dambrun: Conceptualization, Methodology, Software, Formal analysis, Investigation, Writing – Original Draft, Writing – Review & Editing, Visualization, Supervision, Project administration. Adam W. Hanley: Conceptualization, Formal analysis, Writing – Original Draft, Writing – Review & Editing. Eric L. Garland: Conceptualization, Writing – Original Draft, Writing – Review & Editing. Pierre De Oliveira: Conceptualization, Formal analysis, Writing – Original Draft, Writing – Review & Editing. Céline Stinus: Writing – Original Draft, Writing – Review & Editing. Nicolas Pellerin: Conceptualization, Formal analysis, Writing – Original Draft, Writing – Review & Editing. Maya Corman: Conceptualization, Writing – Original Draft, Writing – Review & Editing. Catherine Juneau: Conceptualization, Writing – Original Draft, Writing – Review & Editing.

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