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ORIGINAL PAPER

Emotion Regulation Versus Emotion Care as a Mechanism of Mindfulness in Predicting Well-Being

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Abstract

Objectives Researchers predominantly understand mindfulness in terms of cognitivist or top-down models. However, the applicability of emotion-regulation strategies from such models in mindfulness is questionable. The aim of the current study was to determine whether emotion-regulation strategies (distraction, suppression, and cognitive reappraisal) or alternative emotion-care strategies (anchoring, acceptance, and decentering) were mechanisms that explained the effects of mindfulness on well-being.

Methods A randomized controlled trial was conducted with 283 educators assigned to two groups (8-week mindfulness training vs. waitlist control). At three time points, T0 (baseline), T1 (post-intervention), and T2 (2-month follow-up), they completed questionnaires that measured their levels of mindfulness, well-being (i.e., general health, stress, positive and negative affect, life satisfaction), and frequency in using strategies of emotion regulation and emotion care.

Results Participants in the mindfulness training group reported higher levels of mindfulness and well-being. They also reported more frequent use of all three emotion-care strategies but only one emotion-regulation strategy (cognitive reappraisal) than their counterparts in the control group at T1 and T2. Mediation analyses indicated that none of the three emotion-regulation strategies mediated the effects of mindfulness training on well-being. Instead, anchoring and decentering were significant mediators ($p < 0.05$) while acceptance was a near significant mediator ($p < 0.06$).

Conclusions Emotion-care strategies instead of emotion-regulation strategies were found to be a mechanism that explained the effectiveness of mindfulness. The results offer evidence for an alternative to cognitivist or top-down models in understanding the mechanisms of mindfulness.

Keywords Mindfulness · Emotion regulation · Emotion care · Mechanisms · Strategies

An abundance of research has shown that mindfulness-based interventions (MBIs) are not only effective at reducing psychological distress in clinical populations (Goldberg et al., 2018; Goyal et al., 2014) but also helpful in enhancing mental well-being in healthy populations (Luberto et al., 2018). Despite an increasing body of empirical studies documenting the efficacy of mindfulness, little is known about precisely how and why mindfulness works. The mechanisms

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underlying the effectiveness of mindfulness are an important subject of scientific investigation because by uncovering and understanding the mechanisms, mental health professionals may be able to isolate the most critical components for therapeutic effects and optimize intervention outcomes accordingly.

In recent years, emotion regulation has been attracting attention from many researchers who are interested in the mechanisms of mindfulness (e.g., Chambers et al., 2009; Chiesa et al., 2013; Deng et al., 2021; Farb et al., 2012; Goldin & Gross, 2010; Guendelman et al., 2017; Kaunhoven & Dorjee, 2021; Nakamura et al., 2021; Wenzel et al., 2020). Emotion regulation can be defined as the ability to modulate one's own emotions. Many theories or models have tried to account for emotion regulation and its consequences, e.g., affect regulation theory (Hill, 2015), cognitive-motivation-relational theory of emotion (Lazarus, 1991), evolutionary functional model of affect regulation (Richardson et al., 2016), and process model of emotion regulation (Gross, 1998). Among these models, the process model of emotion regulation holds the distinction of being the most extensively researched and validated model in the field. Consequently, it is frequently utilized by researchers to examine the role of emotion regulation as a mechanism that underlies the effectiveness of mindfulness (e.g., Fisher et al., 2022; Garland et al., 2017; Tungtong et al., 2023).

According to the process model of emotion regulation (Gross, 1998), emotion may be regulated at five points in the emotion generative process: (1) selection of the situation (e.g., to avoid apprehension, an aspiring musician declines an audition); (2) modification of the situation (e.g., to reduce anxiety, this musician requests to have the audition in a familiar studio); (3) deployment of attention (e.g., to calm himself during the audition, he looks away from the stern auditioners); (4) change of cognition (e.g., he does not take the auditioners' harsh comments personally by interpreting this as what they do routinely in audition); (5) modulation of responses (e.g., he suppresses his expression of anxiety and pretends to be calm during the audition).

Among these five families of emotion-regulation strategies, distraction, cognitive reappraisal, and expressive suppression have received much attention from researchers (e.g., Barnhofer et al., 2021; Fisher et al., 2022; Goldin et al., 2017; Moodie et al., 2020). As these strategies are commonly found in traditional psychotherapies, Farb et al. (2012) have called for more studies on them for a better understanding of the role of emotion regulation in mindfulness. According to the process model of emotion regulation (Gross, 1998), the following are the definitions of distraction, cognitive reappraisal, and suppression: (1) Distraction is a strategy of attentional deployment that involves directing attention from the emotional-eliciting aspects to the non-emotional aspects of a situation. (2) Cognitive reappraisal is a strategy of cognitive change that involves modifying the interpretation of a situation to alter emotions. (3) Suppression is a strategy of response modulation that is implemented after an emotional response has been activated, with the aim to reduce negative affect by inhibiting behavioral emotional response.

Although many studies have investigated how mindfulness is related to distraction (e.g., Fisher et al., 2022; Goldin & Gross, 2010), cognitive reappraisal (e.g., Duraney et al., 2022; Goldin et al., 2017), and suppression (e.g., Barnhofer et al., 2021; Kuo et al., 2021), some researchers (Chambers et al., 2009; Guendelman et al., 2017; Hölzel et al., 2011; Nakamura et al., 2021) have reservations in using a cognitivist or top-down model to understand the mechanisms of mindfulness. The terms "bottom-up" and "top-down" refer to the idea of activity within brain regions that are related to the modulation of emotions (Wenzel et al., 2020). A top-down model assumes the cortical or higher-order brain regions (e.g., the prefrontal cortex) dominate or regulate the subcortical or lower-order brain regions (e.g., amygdala). In contrast, a bottom-up model assumes a direct reduced reactivity of the lower-order brain regions without an active recruitment of the higher-order brain regions (Chiesa et al., 2013). As the process model of emotion regulation (Gross, 1998) places significant emphasis on the efficacy of cognitive reappraisal (Webb et al., 2012), it is often regarded as a top-down approach. This approach entails the reinterpretation of incoming emotional information, a process typically associated with higher-order brain regions such as the prefrontal and temporal cortex. On the contrary, some researchers (e.g., Guendelman et al., 2017) argue that mindfulness is more likely to be explained by bottom-up processes in which mindfulness strategies directly modulate sensory-perception and interoceptive-proprioception components of the emotional state without involving the higher-order brain regions.

The challenges against using a top-down model to understand the mechanisms of mindfulness arise from both logical-theoretical concerns and empirical research findings. From a logical-theoretical perspective, there is a contradiction between mindfulness and cognitive reappraisal. Mindfulness, as defined by Kabat-Zinn (2013), is a non-elaborative, non-judgmental awareness of present-moment experience. It is often described by two key components: (1) the regulation of attention to and awareness of the present moment, and (2) the non-judgmental acceptance of these present moment experiences (Bishop et al., 2004). Given the importance of its non-judgmental nature, mindfulness is in contradiction with cognitive reappraisal, which involves deliberate effort to change emotional experiences by means of reinterpretation. In addition, it is also in contradiction with suppression, another strategy in the process model of emotion regulation (Gross, 1998). Mindfulness is antithetical to suppression because it has an emphasis

on the awareness of, and acceptance of, emotional experiences, disregarding their valence or intensity (Chambers et al., 2009).

In addition to the above logical-theoretical concerns, empirical findings from some recent studies have also yielded support for a bottom-up model instead of top-down model as a mechanism underlying the effectiveness of mindfulness. Barnhofer et al. (2021) found a decrease in activation of the right dorsolateral prefrontal cortex in depressed patients after an MBI, indicating a reduction in the use of reappraisal or suppression of negative affective stimuli, and consequently preventing the escalation of negative mood. Bauer et al. (2019) found a reduction of stress level in children and its association with decreased right amygdala activation to fearful faces after an MBI, indicating mindfulness' direct impact on reducing the reactivity of lower-order brain regions. Similarly, Dumontheil et al. (2022) found evidence for reduced amygdala response to emotional face distractors in adolescents after an MBI. The findings from early neuroimaging studies, as reviewed by Farb et al. (2012) and Hölzel et al. (2011), also provided evidence for a bottom-up model. They found that MBIs resulted in reduced prefrontal emotion regulation, enhanced functional and structural changes in interoceptive and sensory regions (such as the insula, somatosensory cortex, and parietal regions), and decreased reactivity to negative emotions and reduced depressive symptoms.

Apart from the above neuroscientific studies, some studies on emotion-regulation strategies also pose challenges to the applicability of the process model of emotion regulation (Gross, 1998) in understanding mindfulness. With longitudinal data, Wenzel et al. (2020) found that mindfulness, and especially its non-judgmental facet, was significantly associated with less use of emotion-regulation strategies such as distraction, cognitive reappraisal, and suppression. In addition, mindfulness was not associated with more effective emotion-regulation strategy implementation. They concluded that the beneficial outcomes of mindfulness were not driven by improving the effectiveness of emotion regulation but lessening the need for effortful emotion regulation. In a study involving patients with multiple sclerosis, Duraney et al. (2022) found that following an MBI, there was an increase in the utilization of the acceptance strategy among these patients. However, there was no significant change observed in the employment of the cognitive reappraisal strategy. In a study of patients with social anxiety disorder, Goldin and Gross (2010) also found that only breath-focused attention, not distraction-focused attention, could decrease negative emotion experience and reduce amygdala activity among the patients after an MBI. It is notable that attention to breath is a basic mindfulness practice and could not simply be classified as distraction or a type of attention deployment strategy.

During a typical practice of attention to breath, mindfulness practitioners are instructed to be aware of body posture, focus on the sensations of breathing (e.g., the rise and fall of abdomen), accept the sensations of breathing as they are in the present moment, be non-judgmental of mind wandering, and return the focus of attention back to the sensations gently but firmly after digression of thoughts (Doll et al., 2016). This practice has an intention of anchoring, i.e., to be settled or grounded with the focused attention to breath and bodily sensations. The sense of being anchored to breath and bodily sensations has strong stabilizing and calming effects when coupled with an allowing attitude. Embodiment, the process of being fully connected to and aware of one's body, is a key in anchoring. In their seminal book "Mindfulness-Based Cognitive Therapy for Depression," Segal et al. (2013) stated that "working through the body door allows us to cultivate a more 'allowing' relationship to intensely unpleasant experiences" (p. 138). Their claim was supported by Doll et al. (2016) who found that attention to breath was effective in modulating aversive emotions, reducing amygdala activation, and increasing amygdala-prefrontal integration.

Being anchored to one's breath or bodily sensations has far more substance than deployment of attention or distraction from emotional stimuli. It is reasonable to hypothesize that anchoring instead of distraction is a mechanism that explains how mindfulness works. In a similar vein, it is also reasonable to hypothesize that acceptance instead of suppression is a mechanism that accounts for the effectiveness of mindfulness because non-judgmental acceptance of the present moment experiences is a key component of mindfulness (Bishop et al., 2004). Within the context of MBIs, acceptance involves allowing emotional experiences to emerge, evolve, and naturally fade away without any intentional effort to alter them. In the first three sessions of a typical 8-week mindfulness curriculum (e.g., Mindfulness-based Stress Reduction Program, Mindfulness-based Cognitive Therapy Program), participants are taught practices that promote anchoring and acceptance. These practices include sitting meditation with focused attention to breath and lying-down meditation (body scan) with awareness of bodily sensations.

In the fourth session of a typical 8-week mindfulness curriculum, decentering, a new practice is introduced. In this practice, participants are instructed not to identify with their thoughts, feelings, sensations, and impulses to act. Instead, they are encouraged to relate to present-moment experiences as passing events in the mind and body (Segal et al., 2013). Bernstein et al. (2015) propose that decentering is constituted of three processes: (1) meta-awareness, (2) disidentification from internal experience, and (3) reduced reactivity. Although decentering has been conceptualized by some researchers as a form of cognitive reappraisal (Gross, 2015; Moodie et al., 2020), it is different from cognitive

reappraisal in many significant ways. First, while cognitive reappraisal involves changing unpleasant thoughts of emotional stimuli to render them less distressing, decentering involves seeing these thoughts as merely mental events and allowing them to arise and pass without intervention. Second, cognitive reappraisal seeks to change the content of cognitive and emotional events, but decentering changes one's relationship to these events, i.e., from an antagonistic relationship to an allowing relationship. Third, cognitive reappraisal is an antecedent-focused strategy that prevents the generation of potentially distressing emotions by cognitively re-evaluating a situation. In contrast, decentering is a response-focused strategy that takes place after potentially distressing emotions have arisen. Lastly, cognitive reappraisal is taught explicitly in cognitive therapy but not in MBIs. Instead, MBIs teach decentering to participants after they have completed 3 or 4 weeks of practices in anchoring and acceptance.

To sum up, how much the process model of emotion regulation (Gross, 1998) can explain the mechanism of mindfulness remains uncertain. Specifically, the applicability of its three strategies (distraction, suppression, and cognitive reappraisal) in mindfulness requires further deliberation. Perhaps, it is time for researchers to consider another three more promising strategies (anchoring, acceptance, and decentering) in their investigations of the underlying mechanisms of mindfulness. Some researchers call these alternatives "mindful emotion regulation" strategies (Chambers et al., 2009; Chiesa et al., 2013; Farb et al., 2012; Grecucci et al., 2015; Guendelman et al., 2017). This term highlights the uniqueness of emotion processing in mindfulness but the use of the words "emotion regulation" may still lead to a lack of differentiation from the cognitive strategies of the process model of emotion regulation (Gross, 1998). As this process model is the most widely researched and validated model in emotion regulation, the term "emotion regulation" is spontaneously associated with this cognitivist model. Furthermore, the word "regulate" goes against the attitudes of mindfulness. According to the dictionary, "regulate" means "to control something, especially by making it work in a particular way" (Cambridge University Press & Assessment, n.d.). This definition is contradictory to the attitudes of mindfulness advocated by Kabat-Zinn (2013), namely non-judging, patience, beginner's mind, trust, non-striving, acceptance, and letting go.

A close examination of the anchoring, acceptance, and decentering strategies reveals no intention to "control emotions by making them work in a particular way." Instead, these strategies help one to remain mindfully aware of any emotion that is experienced, disregarding its apparent valence or magnitude. The awareness and nonreactivity cultivated in mindfulness practices lead to detachment from what is experienced, enabling individuals to choose more consciously those thoughts, emotions, and sensations that they will identify with, rather than habitually reacting to them. By doing so, the automatic process of appraisal that generates disturbing emotions is weakened (Chambers et al., 2009). Mindfulness practitioners do not "regulate" their emotion. Instead, they "take care of" their emotion with awareness and nonreactivity. To avoid the misconception and confusion related to the term "emotion regulation," we propose using the term "emotion care" to describe the anchoring, acceptance, and decentering strategies taught in MBIs.

The purpose of the current study was to compare the three emotion-regulation strategies (distraction, suppression, and cognitive reappraisal) of the process model (Gross, 1998) with the three emotion-care strategies (anchoring, acceptance, and decentering) of mindfulness and test which set of strategies could better explain the effects of an MBI on participants' well-being. This was a randomized controlled trial with longitudinal data from multiple time points in an educational context. The participants were teachers or school personnel who were randomly assigned to an MBI group or a waitlist control group.

We set out to test two hypotheses: (1) Mindfulness training has effects on participants' well-being and their frequency of using emotion-care strategies but not emotion-regulation strategies. (2) It is the increased use of emotion-care strategies, not emotion-regulation strategies, that explains the mechanism of the effects of mindfulness training on participants' well-being.

Method

Participants

The participants came from a subsample of a sizable longitudinal project in education settings (Tsang et al., 2021). This was a combined intervention and research project with a mission to promote mindfulness culture in schools. Recruitment emails were sent to all local elementary and secondary schools in Hong Kong. In response to the recruitment, 484 teachers or school personnel indicated interest and filled out the screening questionnaire. Eligible participants met the following criteria: working in local schools or education institutions, not experiencing severe or unstable mental health conditions at the time of recruitment, and having no extensive previous experience with mindfulness (Fig. 1). After excluding those who were ineligible, and considering the availability of resources from the research team, the final sample included 283 school teachers and personnel (77% female) from 94 different schools located in various districts in Hong Kong. Most participants (77.40%) were teachers, while 19.80% were social workers/counsellors/educational

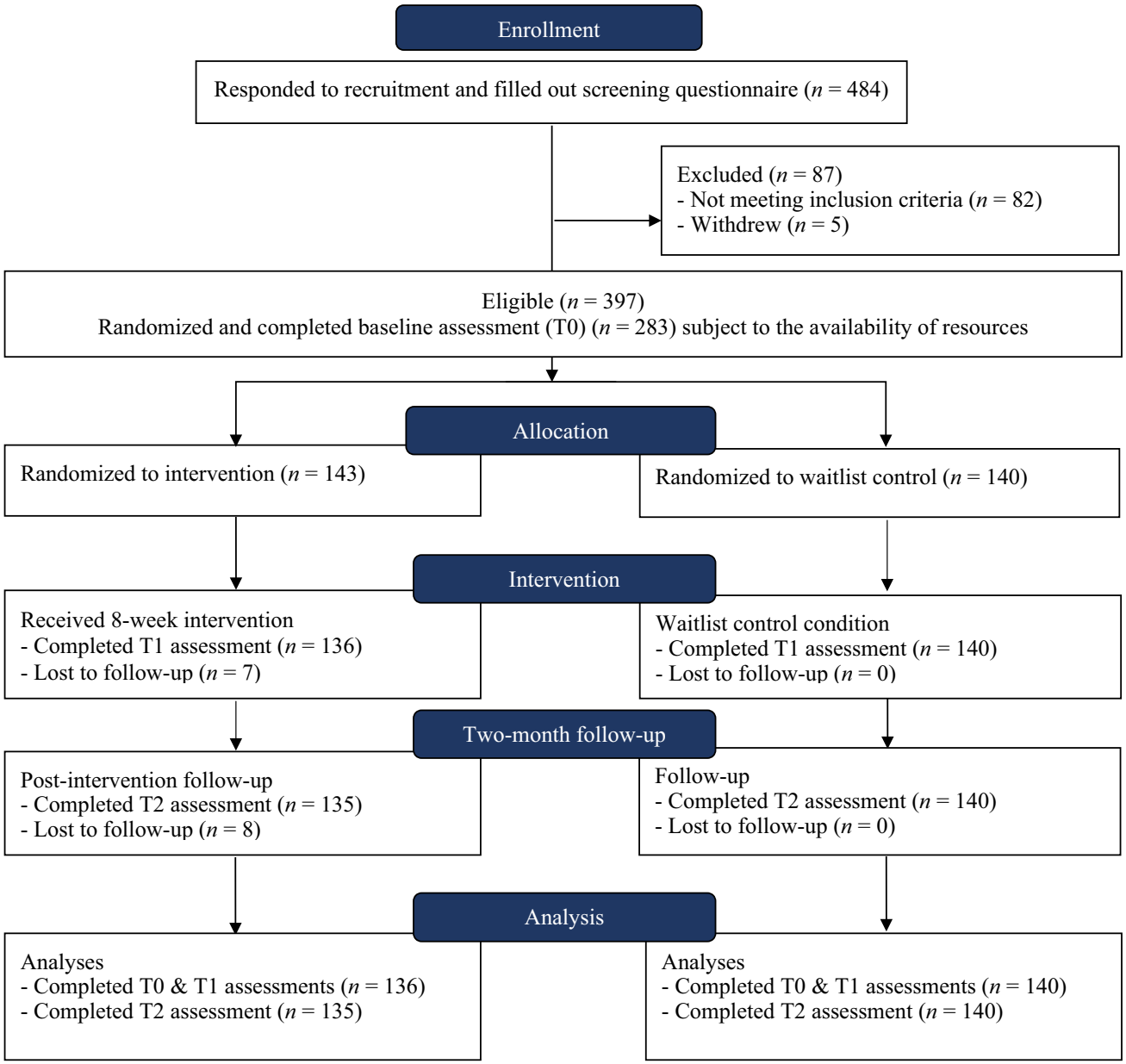


Fig. 1 A CONSORT flow diagram

psychologists, and 2.80% were school supporting staff (e.g., executive assistant). Participants' ages ranged from 19 to 64 years old ($M = 39.64$, $SD = 10.22$), and their years of working experience in schools ranged from less than 1 year to 36 years ($M = 15.04$, $SD = 9.65$).

Procedures

Written consent was obtained from participants according to the procedures approved by the Institutional Review Board of the first author. Participants were randomized to either the mindfulness training condition ($n = 143$) or waitlist control condition ($n = 140$), stratified by the gender of participants. Those randomized to the mindfulness condition attended the 8-week mindfulness training first, while those randomized to the waitlist condition attended the same training 4 months later. Participants completed online self-report surveys at three time points—baseline (T0), post-intervention (T1), and 2-month follow-up (T2). Participants received the mindfulness training at no cost and a certificate of completion would be presented to them if their attendance rate reached 80%.

Intervention

The 8-week MBI was .b Foundations—a school-based mindfulness training program developed by the Mindfulness in Schools Project (MiSP) tailor-made for adults in school setting (Beshai et al., 2016). Its effectiveness was evident in a randomized controlled trial (Tsang et al., 2021). The .b Foundations curriculum stems from the core elements of the mindfulness-based stress reduction (Kabat-Zinn, 2013), mindfulness-based cognitive therapy (Segal et al., 2013), and *Mindfulness: Finding Peace in a Frantic World* (Williams & Penman, 2011) adapted for non-clinical populations. Similar to these programs, the .b Foundations is a group-based intervention with a blend of experiential and interactive learning activities. It comprises an orientation session and eight 90-min sessions (12 contact hours in total). Each session consists of a specific theme, and a structured set of formal and informal mindfulness practices, and cognitive exercises (see an overview in Tsang et al., 2021). Audio guides were provided to support participants' home practice (around 20 min daily).

In the experimental condition, nine groups of the 8-week .b Foundations course were implemented on weekday evenings in nine venues. The time and location were made convenient for teachers' participation after school. Each group had an average of 15 to 17 participants. In the waitlist control condition, another nine groups were conducted in the same nine venues 2 months after the participants in the experimental condition completed the course. Eleven mindfulness teachers (two males and nine females) were responsible for teaching all these 18 groups. They were healthcare professionals who had been trained and had the qualifications to teach .b Foundations.

Measures

The self-report survey comprised the measures on participants' level of mindfulness, well-being (i.e., general health, stress, positive and negative affect, life satisfaction), frequencies of using strategies pertaining to emotion regulation (i.e., distraction, suppression, cognitive reappraisal), and emotion care (i.e., anchoring, acceptance, decentering). The descriptive statistics and internal consistency measures (Cronbach's alpha and McDonald's omega) of each measure at each time point are presented in Table 2.

Mindfulness

The 12-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007) was used to measure mindfulness. It comprises four core aspects of mindfulness—attention regulation, present-focus, awareness, and non-judgment. Sample items include "I am able to focus on the present moment," and "I am preoccupied by the future" (reversed item). Participants rated the items on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). After reversing negatively worded items, higher score indicates higher level of mindfulness.

General Health

The 12-item General Health Questionnaire (GHQ-12; Goldberg & Williams, 1988) was used to measure the extent to which participants encounter problems with strain, concentration, self-confidence, and mood. Sample items include "able to enjoy normal day-to-day activities," and "loss of confidence in self" (reversed item). Participants rated the items on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). After reversing negatively worded items, higher score represents better general health.

Stress

To measure participants' perceived stress in daily lives, the 10-item Perceived Stress Scale (PSS; Cohen et al., 1983) was used. Sample items include "unable to control the important things in my life," and "things are going my way" (reversed item). Participants rated the items on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). After reversing positively worded items, higher score indicates higher level of stress.

Positive Affect

To measure positive affect, four emotional states—"happy," "attentive," "calm," and "determined"—were selected from the expanded version of the Positive and Negative Schedule (PANAS-X; Watson & Clark, 1994). Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more positive affect.

Negative Affect

To measure negative affect, four emotional states—"nervous," "angry," "upset," and "guilty"—were selected from the PANAS-X (Watson & Clark, 1994). Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more negative affect.

Life Satisfaction

To measure participants' subjective quality of life, the 5-item Satisfaction with Life Scale (SWLS; Diener et al., 1985) was used. A sample item is "I am satisfied with my life." Participants rated on a 5-point Likert scale from 1 (*Never*)

to 5 (*Always*). Higher score indicates higher level of life satisfaction.

Distraction

Distraction pertains to attentional deployment. Seven items were initially developed in accordance with the process model of emotion regulation (Gross, 1998). During the process of pruning, an item was deleted for parsimony and a pilot study ($n = 53$) was conducted to check the internal consistency of the items. An item with lowest item-total correlation was deleted, resulting in five items eventually. The details of the scale development and psychometric properties are described in the Supplementary Information. A sample item is "when I want to feel fewer negative emotions, I think of other things to distract my attention." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more frequent use of distraction.

Suppression

Suppression was measured by the 4-item suppression subscale of ERQ (Gross & John, 2003). A sample item is "I control my emotions by not expressing them." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more frequent use of suppression.

Cognitive Reappraisal

Reappraisal was measured by the 6-item subscale of Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). A sample item is "when I want to feel fewer negative emotions, I change the way I'm thinking about the situation." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more frequent use of cognitive reappraisal.

Anchoring

To measure participants' use of anchoring—to be settled or grounded with the focused attention on breath or/and bodily sensations (Williams & Penman, 2011)—seven items were initially developed by a group of mindfulness teachers. During the process of pruning, an item was deleted for parsimony and a pilot study ($n = 53$) was conducted to check the internal consistency of the items. An item with lowest item-total correlation was deleted, resulting in five items eventually. The details of the scale development and psychometric properties are described in the Supplementary Information. A sample item is "I notice the sensation of my feet on the floor, in order to calm my restless mind." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (Always). Higher score indicates more frequent use of anchoring.

Acceptance

Acceptance was measured by the 3-item acceptance subscale of the CAMS-R (Feldman et al., 2007). A sample item is "I am able to accept the thoughts and feelings I have." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (Always). Higher score indicates more frequent use of acceptance.

Decentering

Decentering was measured by the 4-item non-reactivity subscale of the Chinese version Five Facet Mindfulness Questionnaire (FFMQ-C, Hou et al., 2014). A sample item is "when I have distressing thoughts or images, I just notice them and let them go." Participants rated on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*). Higher score indicates more frequent use of decentering.

Intervention Fidelity Measures

To ensure the quality of the implementation of the 8-week mindfulness training by different mindfulness teachers, one participant in each group was randomly invited to complete an intervention fidelity form after each session. Participants indicated if the core concepts and practices were covered during the session ("yes" or "no"), and rated whether the mindfulness teacher's instructions were clear on a 4-point Likert scale from 1 (*Strongly Disagree*) to 4 (*Strongly Agree*).

Program Acceptability Measures

To examine the extent to which participants accepted the 8-week mindfulness training and whether they did mindfulness practice regularly, participants rated their agreement to the following statements at post-intervention, including "know more about mindfulness," "gain better self-understanding," "improve health," "have positive influence," "practise mindfulness daily during the course," "would recommend the course to others," and "interested in sharing mindfulness with students" on a 5-point Likert scale from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*).

Data Analyses

Preliminary analyses were conducted to ensure that the intervention and control conditions were equivalent in terms of the demographic characteristics and baseline measures. Intervention fidelity, program acceptability, and manipulation check were examined to establish the social credibility and validity of the 8-week mindfulness training.

To examine the effects of mindfulness training at post-intervention (T1) and 2-month follow-up (T2), we fitted the same multilevel model separately for each of the outcome measures by restricted maximum likelihood. The models included a random intercept of the participants, in addition to condition (0 = control vs. 1 = intervention) and time (T0, T1, T2) and their interactions as the fixed effects. As we were interested in the training effect at each time point, the time factor was dummy-coded, in which the change from T0 to T1 ($Time_{T1\text{-}T0}$) and the change from T0 to T2 ($Time_{T2\text{-}T0}$) were estimated separately. Two planned contrasts of the estimated marginal mean (T1–T0 and T2–T0) were conducted as the post hoc tests, and Cohen's *d*s were calculated.

To compare the three emotion-care strategies of mindfulness with the emotion-regulation strategies of Gross' (1998) process model, three parallel multiple mediation analyses were conducted to test the mediation effects of each emotion-care strategy in the presence of its emotion-regulation counterpart using the PROCESS macro (Model 4; Hayes, 2022). We used the change score approach that treated the change in the mediating variable (i.e., the use of strategies) as the explanatory variable for the change in outcome (i.e., well-being). For the sake of parsimony, five measures of well-being—including general health, positive affect, life satisfaction, stress, and negative affect—were grouped into a standardized composite score after the latter two were reverse-coded. The changes in mediators from T0 to T1 were calculated as the mediator, and the changes in composite scores from T0 to T2 were calculated as the outcome.

Results

Preliminary Analyses

Baseline Comparison of Two Conditions

Table 1 summarizes the demographic characteristics: gender, age, and years of working experience of the intervention and waitlist control conditions. Results of the χ^2 test and independent sample *t*-tests indicated no significant differences in demographic characteristics between conditions. Table 2 presents the descriptive statistics of the baseline measures of the intervention and control conditions. Results of the independent sample *t*-tests found no significant differences between conditions on any baseline measures. Thus, randomization was effective in ensuring that the intervention and control groups were equivalent at baseline.

Intervention Fidelity

Across all training sessions, all participants (100%) reported "yes" to the questions asking whether the core concepts and practices were covered in the sessions. All participants (100%) agreed or strongly agreed that their mindfulness teachers' instructions were clear, and no significant differences were found across different mindfulness teachers.

Program Acceptability

Almost all participants (97.90%) were able to attend 80% of the 8-week mindfulness training. Participants agreed or strongly agreed that because of the training, they were able to "know more about mindfulness" (97.70%), "gain better self-understanding" (88.20%), "improve health" (92.60%), and "receive positive influence" (96.40%). Most of them "would recommend the course to others" (97.80%), and "interested in sharing mindfulness with their students" (86.80%). Yet only 41.20% indicated that they practiced mindfulness daily during the 8-week course.

Manipulation Check

The multilevel model results of the manipulation check are shown in Table 3. The interaction effects ($Condition_{Exp} \times Time_{T1\text{-}T0}$ and $Condition_{Exp} \times Time_{T2\text{-}T0}$) indicated an intervention effect for mindfulness. The results showed a significant increase in mindfulness for the

Table 1 Participants' demographics split by intervention and control conditions

Demographics	Mindfulness training ($n = 143$)			Waitlist control ($n = 140$)			
	n	%	*M* (*SD*)	*n*	%	*M* (*SD*)	
Gender							$\chi^2(1) = .06, p = 0.81$
Male	32	22.40%		33	23.60%		
Female	111	77.60%		107	76.40%		
Age in years			39.45 (9.85)			39.83 (10.61)	$t(278) = 0.31, p = 0.76$
Years of working experience in school			14.62 (9.50)			15.49 (9.81)	$t(277) = 0.75, p = 0.45$

Table 2 Descriptive statistics and reliability of outcome measures across three time points of data collection

Outcome measure				Mindfulness training	Waitlist control
	Time[a]	α[b]	ω[c]	*M* (*SD*)	*M* (*SD*)
Mindfulness	T0	0.76	0.84	3.21 (0.38)	3.29 (0.39)
	T1	0.78	0.85	3.46 (0.33)	3.28 (0.40)
	T2	0.82	0.87	3.47 (0.36)	3.21 (0.42)
General health	T0	0.86	0.89	3.45 (0.47)	3.47 (0.50)
	T1	0.85	0.80	3.72 (0.37)	3.48 (0.46)
	T2	0.88	0.91	3.69 (0.46)	3.46 (0.48)
Stress	T0	0.86	0.89	2.75 (0.50)	2.70 (0.50)
	T1	0.87	0.90	2.50 (0.44)	2.73 (0.49)
	T2	0.88	0.91	2.53 (0.52)	2.73 (0.47)
Negative affect	T0	0.73	0.78	2.71 (0.58)	2.72 (0.53)
	T1	0.76	0.81	2.45 (0.47)	2.67 (0.55)
	T2	0.79	0.83	2.40 (0.58)	2.64 (0.57)
Positive affect	T0	0.69	0.73	3.33 (0.55)	3.41 (0.56)
	T1	0.69	0.70	3.61 (0.47)	3.38 (0.55)
	T2	0.74	0.79	3.59 (0.51)	3.34 (0.53)
Life satisfaction	T0	0.90	0.93	3.27 (0.73)	3.28 (0.69)
	T1	0.90	0.92	3.54 (0.61)	3.26 (0.66)
	T2	0.91	0.94	3.55 (0.66)	3.28 (0.67)
Distraction	T0	0.90	0.92	3.08 (0.65)	3.15 (0.59)
	T1	0.94	0.96	3.20 (0.65)	3.19 (0.62)
	T2	0.93	0.94	3.28 (0.64)	3.22 (0.54)
Suppression	T0	0.80	0.85	2.64 (0.72)	2.74 (0.79)
	T1	0.75	0.83	2.71 (0.67)	2.77 (0.71)
	T2	0.72	0.85	2.75 (0.61)	2.84 (0.70)
Cognitive reappraisal	T0	0.87	0.91	3.16 (0.62)	3.20 (0.56)
	T1	0.89	0.94	3.49 (0.54)	3.19 (0.59)
	T2	0.90	0.94	3.45 (0.56)	3.21 (0.59)
Anchoring	T0	0.91	0.93	2.59 (0.74)	2.69 (0.76)
	T1	0.93	0.95	3.52 (0.58)	2.82 (0.73)
	T2	0.93	0.95	3.43 (0.69)	2.72 (0.70)
Acceptance	T0	0.68	0.70	2.76 (0.56)	2.82 (0.49)
	T1	0.73	0.75	2.95 (0.47)	2.87 (0.52)
	T2	0.66	0.71	2.99 (0.52)	2.77 (0.49)

Table 2 (continued)

Outcome measure	Time[a]	α^b	ω^c	Mindfulness training *M* (*SD*)	Waitlist control *M* (*SD*)
Decentering	T0	0.77	0.80	2.84 (0.60)	2.91 (0.59)
	T1	0.77	0.82	3.32 (0.51)	2.97 (0.57)
	T2	0.81	0.83	3.27 (0.56)	2.86 (0.56)

Participants responded on a 5-point Likert scale from 1 (*Never*) to 5 (*Always*)

[a]T0 = baseline; T1 = post-intervention; T2 = 2-month follow-up. No significant baseline differences between the mindfulness training and waitlist control conditions for any outcome measures

[b]α = Cronbach's alpha

[c]ω = McDonald's omega

experimental group at both T1 and T2 from T0, indicating the successful implementation of the mindfulness training.

Main Analyses

Intervention Effects on Well-being

As shown in Table 3, the $\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T1-T0}}$ and $\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T2-T0}}$ were significant for all the well-being measures. The results showed a significant increase in general health, positive affect, and life satisfaction, as well as a significant decrease in stress and negative affect at T1 and T2 in the training group, suggesting the benefits of mindfulness training on the participants' well-being. The effect sizes were large for all well-being measures (*d*-values ranging from 0.75 to 1.08; Table 5).

Intervention Effects on Strategies

The multilevel model results in Table 4 indicated that participants in the mindfulness training reported significantly more frequent use of emotion-care strategies—anchoring, acceptance, and decentering—at T1 and T2 (*d*-values ranging from 0.59 to 1.92; Table 5). In contrast, only one of the emotion-regulation strategies— cognitive reappraisal—significantly increased at T1 and T2 when compared with T0 ($d = 0.86$ and 0.75, respectively; Table 5). The results of the multilevel model showed no significant changes in the use of distraction and suppression at either T1 or T2, despite some significant pairwise comparisons.

Mechanisms of Mindfulness Training

To explore the mechanisms underlying the effects of mindfulness training on participants' well-being, a series of parallel multiple mediation analyses with bootstrapping (2000 resamples) were conducted (Hayes, 2022). As illustrated in Fig. 2a, the indirect effect of anchoring was 0.17, 95% *CI* [0.04, 0.32] while the indirect effect of distraction was − 0.00, 95% *CI* [− 0.04, 0.03]. This indicated that anchoring was a significant mediator of the effects of mindfulness training on participants' well-being at 2-month follow-up, while distraction was not. As shown in Fig. 2b, the indirect effect of acceptance was 0.03, 95% *CI* [− 0.00, 0.09] while the indirect effect of suppression was − 0.00, 95% *CI* [− 0.04, 0.01]. This indicated that acceptance was a near significant mediator, but suppression was not a significant mediator. The indirect effect of decentering, as shown in Fig. 2c, was 0.12, 95% *CI* [0.02, 0.21], while the indirect effect of cognitive reappraisal was 0.06, 95% *CI* [− 0.02, 0.15]. Hence, decentering, not cognitive reappraisal, was a mediator that accounted for the effects of mindfulness training on participants' well-being. In sum, as shown in

Table 3 Multilevel model results predicting outcome measures fit by restricted maximum likelihood

Predictors	Mindfulness		General Health		Stress		Negative Affect		Positive Affect		Life Satisfaction	
	b CI [LL, UL]	*p*	*b* CI [LL, UL]	*p*	*b* CI [LL, UL]	*p*	*b* CI [LL, UL]	*p*	*b* CI [LL, UL]	*p*	*b* CI [LL, UL]	*p*
(Intercept)	**3.29 [3.22, 3.35]**	**< 0.001**	**3.47 [3.40, 3.55]**	**< 0.001**	**2.70 [2.62, 2.78]**	**< 0.001**	**2.72 [2.63, 2.81]**	**< 0.001**	**3.41 [3.32, 3.50]**	**< 0.001**	**3.28 [3.17, 3.39]**	**< 0.001**
$\text{Condition}_{\text{Exp}}$	−0.08 [−0.17, 0.01]	0.07	−0.02 [−0.13, 0.09]	0.73	0.05 [−0.07, 0.16]	0.43	−0.005 [−0.13, 0.12]	0.94	−0.08 [−0.20, 0.05]	0.22	−0.02 [−0.17, 0.14]	0.85
$\text{Time}_{\text{T1-T0}}$	−0.001 [−0.06, 0.05]	0.97	0.01 [−0.05, 0.07]	0.73	0.03 [−0.04, 0.09]	0.42	−0.05 [−0.13, 0.03]	0.25	−0.03 [−0.11, 0.05]	0.40	−0.03 [−0.11, 0.06]	0.55
$\text{Time}_{\text{T2-T0}}$	**−0.08 [−0.13, −0.02]**	**0.005**	−0.01 [−0.07, 0.05]	0.74	0.03 [−0.04, 0.10]	0.37	−0.08 [−0.16, 0.003]	0.06	−0.07 [−0.15, 0.01]	0.07	0.001 [−0.08, 0.09]	0.97
$\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T1-T0}}$	**0.27 [0.19, 0.35]**	**< 0.001**	**0.27 [0.18, 0.35]**	**< 0.001**	**−0.29 [−0.38, −0.19]**	**< 0.001**	**−0.22 [−0.34, −0.11]**	**< 0.001**	**0.32 [0.21, 0.43]**	**< 0.001**	**0.30 [0.18, 0.42]**	**< 0.001**
$\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T2}-\text{T0}}$	**0.34 [0.27, 0.43]**	**< 0.001**	**0.24 [0.16, 0.33]**	**< 0.001**	**−0.25 [−0.35, −0.16]**	**< 0.001**	**−0.24 [−0.36, −0.12]**	**< 0.001**	**0.33 [0.21, 0.44]**	**< 0.001**	**0.27 [0.15, 0.39]**	**< 0.001**
Random Effect												
σ^2	0.06		0.07		0.08		0.12		0.12		0.13	
τ_{00}	0.09_{PARTID}		0.15_{PARTID}		0.16_{PARTID}		0.17_{PARTID}		0.16_{PARTID}		0.33_{PARTID}	
ICC	0.61		0.69		0.67		0.58		0.59		0.72	
N	283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}	
Observations	834		834		834		834		834		834	
Marginal R^2/ conditional R^2	0.08/0.64		0.06/0.71		0.04/0.68		0.05/0.61		0.05/0.61		0.03/0.73	

Table 4 Multilevel model results predicting strategies fit by restricted maximum likelihood

Predictors	Distraction		Suppression		Reappraisal		Anchoring		Acceptance		Decentering	
	b *CI* [LL, UL]	*p*	*b* *CI* [LL, UL]	*p*	*b* *CI* [LL, UL]	*p*	*b* *CI* [LL, UL]	*p*	*b* *CI* [LL, UL]	*p*	*b* *CI* [LL, UL]	*p*
(Intercept)	**3.15** **[3.05, 3.25]**	**< 0.001**	**2.74** **[2.62, 2.85]**	**< 0.001**	**3.20** **[3.11, 3.30]**	**< 0.001**	**2.69** **[2.57, 2.81]**	**< 0.001**	**2.82** **[2.73, 2.90]**	**< 0.001**	**2.91** **[2.82, 3.01]**	**< 0.001**
$\text{Condition}_{\text{Exp}}$	− 0.07 [− 0.21, 0.07]	0.35	− 0.10 [− 0.13, 0.09]	0.24	− 0.04 [− 0.18, 0.09]	0.43	− 0.10 [− 0.26, 0.07]	0.24	− 0.05 [− 0.17, 0.06]	0.37	− 0.07 [− 0.17, 0.14]	0.85
$\text{Time}_{\text{T1-T0}}$	0.04 [− 0.06, 0.14]	0.47	0.04 [− 0.05, 0.07]	0.52	− 0.01 [− 0.10, 0.09]	0.42	**0.13** **[0.02, 0.24]**	**0.03**	0.05 [− 0.03, 0.13]	0.23	0.06 [− 0.20, 0.06]	0.55
$\text{Time}_{\text{T2-T0}}$	0.07 [− 0.03, 0.17]	0.20	0.11 [0.00, 0.21]	0.06	0.01 [− 0.08, 0.10]	0.37	0.02 [− 0.09, 0.14]	0.68	− 0.05 [− 0.12, 0.03]	0.26	− 0.06 [− 0.08, 0.09]	0.97
$\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T1-T0}}$	0.08 [− 0.06, 0.23]	0.25	0.05 [− 0.11, 0.20]	0.35	**0.35** **[0.21, 0.48]**	**< 0.001**	**0.80** **[0.64, 0.96]**	**< 0.001**	**0.15** **[0.04, 0.26]**	**0.009**	**0.43** **[0.30, 0.56]**	**< 0.001**
$\text{Condition}_{\text{Exp}} \times \text{Time}_{\text{T2}-\text{T0}}$	0.13 [− 0.02, 0.27]	0.08	0.03 [− 0.13, 0.18]	0.28	**0.28** **[0.15, 0.42]**	**< 0.001**	**0.81** **[0.65, 0.98]**	**< 0.001**	**0.28** **[0.17, 0.39]**	**< 0.001**	**0.50** **[0.37, 0.63]**	**< 0.001**
Random Effect												
σ^2	0.18		0.21		0.16		0.23		0.11		0.15	
τ_{00}	0.19_{PARTID}		0.28_{PARTID}		0.18_{PARTID}		0.26_{PARTID}		0.15_{PARTID}		0.17_{PARTID}	
ICC	0.51		0.57		0.53		0.53		0.57		0.53	
N	283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}		283_{PARTID}	
Observations	834		834		834		834		834		834	
Marginal R^2/ conditional R^2	0.009/0.52		0.008/0.57		0.05/0.56		0.22/0.63		0.03/0.59		0.11/0.58	

Table 5 Contrast of estimated marginal mean (EMM_{diff}) between baseline (T0) and subsequent time points

Outcome measure	Time[a]	Mindfulness training			Waitlist control		
		EMM_{diff} (SE)	*p*[b]	*d CI [LL, UL]*	*EMM_{diff} (SE)*	*p*[b]	*d CI [LL, UL]*
Mindfulness	T1–T0	**0.27 (0.03)**	**< 0.001**	**1.13 [0.88, 1.38]**	−0.001 (0.03)	1.00	0.005 [−0.23, 0.24]
	T2–T0	**0.27 (0.03)**	**< 0.001**	**1.14 [0.89, 1.38]**	**−0.08 (0.03)**	**0.01**	**0.33 [0.10, 0.57]**
General health	T1–T0	**0.28 (0.03)**	**< 0.001**	**1.08 [0.84, 1.33]**	0.01 (0.03)	1.00	0.04 [−0.19, 0.28]
	T2–T0	**0.23 (0.03)**	**< 0.001**	**0.91 [0.67, 1.15]**	−0.01 (0.03)	1.00	−0.04 [−0.27, 0.19]
Stress	T1–T0	**−0.26 (0.03)**	**< 0.001**	**−0.92 [−1.16, −0.68]**	0.03 (0.03)	0.84	0.09 [−0.14, 0.33]
	T2–T0	**−0.22 (0.03)**	**< 0.001**	**−0.79 [−1.03, −0.55]**	0.03 (0.03)	0.75	0.10 [−0.13, 0.34]
Negative affect	T1–T0	**−0.27 (0.04)**	**< 0.001**	**−0.77 [−1.01, −0.53]**	−0.05 (0.04)	0.50	−0.14 [−0.37, 0.10]
	T2–T0	**−0.32 (0.04)**	**< 0.001**	**−0.91 [−1.15, −0.67]**	−0.08 (0.04)	0.12	−0.22 [−0.46, 0.01]
Positive affect	T1–T0	**0.29 (0.04)**	**< 0.001**	**0.84 [0.60, 1.08]**	−0.03 (0.04)	0.81	−0.10 [−0.34, 0.14]
	T2–T0	**0.25 (0.04)**	**< 0.001**	**0.75 [0.50, 0.99]**	−0.07 (0.04)	0.14	−0.22 [−0.45, 0.02]
Life satisfaction	T1–T0	**0.28 (0.04)**	**< 0.001**	**0.77 [0.53, 1.02]**	−0.03 (0.04)	1.00	−0.07 [−0.31, 0.16]
	T2–T0	**0.28 (0.04)**	**< 0.001**	**0.77 [0.53, 1.01]**	0.001 (0.04)	1.00	0.004 [−0.23, 0.24]
Distraction	T1–T0	**0.12 (0.05)**	**0.04**	**0.28 [0.05, 0.52]**	0.04 (0.05)	0.94	0.09 [−0.15, 0.32]
	T2–T0	**0.19 (0.05)**	**< 0.001**	**0.45 [0.21, 0.69]**	0.07 (0.05)	0.40	0.15 [−0.08, 0.39]
Suppression	T1–T0	0.08 (0.06)	0.29	0.18 [−0.06, 0.41]	0.04 (0.06)	1.00	0.08 [−0.16, 0.31]
	T2–T0	**0.13 (0.06)**	**0.04**	**0.29 [0.05, 0.52]**	0.11 (0.06)	0.11	0.23 [−0.006, 0.46]
Cognitive reappraisal	T1–T0	**0.34 (0.05)**	**< 0.001**	**0.86 [0.61, 1.10]**	−0.01 (0.05)	1.00	−0.02 [−0.25, 0.22]
	T2–T0	**0.30 (0.05)**	**< 0.001**	**0.75 [0.51, 0.99]**	0.01 (0.05)	1.00	0.03 [−0.21, 0.27]
Anchoring	T1–T0	**0.93 (0.06)**	**< 0.001**	**1.92 [1.66, 2.19]**	0.13 (0.06)	0.05	0.27 [0.03, 0.50]
	T2–T0	**0.84 (0.06)**	**< 0.001**	**1.73 [1.47, 1.99]**	0.02 (0.06)	1.00	0.05 [−0.18, 0.29]
Acceptance	T1–T0	**0.20 (0.04)**	**< 0.001**	**0.59 [0.35, 0.83]**	0.05 (0.04)	0.47	0.14 [−0.09, 0.38]
	T2–T0	**0.23 (0.04)**	**< 0.001**	**0.69 [0.45, 0.93]**	−0.05 (0.04)	0.51	−0.14 [−0.37, 0.10]
Decentering	T1–T0	**0.49 (0.05)**	**< 0.001**	**1.27 [1.02, 1.51]**	0.06 (0.05)	0.38	0.16 [−0.08, 0.39]
	T2–T0	**0.44 (0.05)**	**< 0.001**	**1.14 [0.89, 1.39]**	−0.06 (0.05)	0.44	−0.15 [−0.38, 0.09]

[a]T0 = baseline; T1 = post-intervention; T2 = 2-month follow-up

[b]*p*-value adjusted for multiple comparisons using Bonferroni method for two tests (T1–T0, T2–T0)

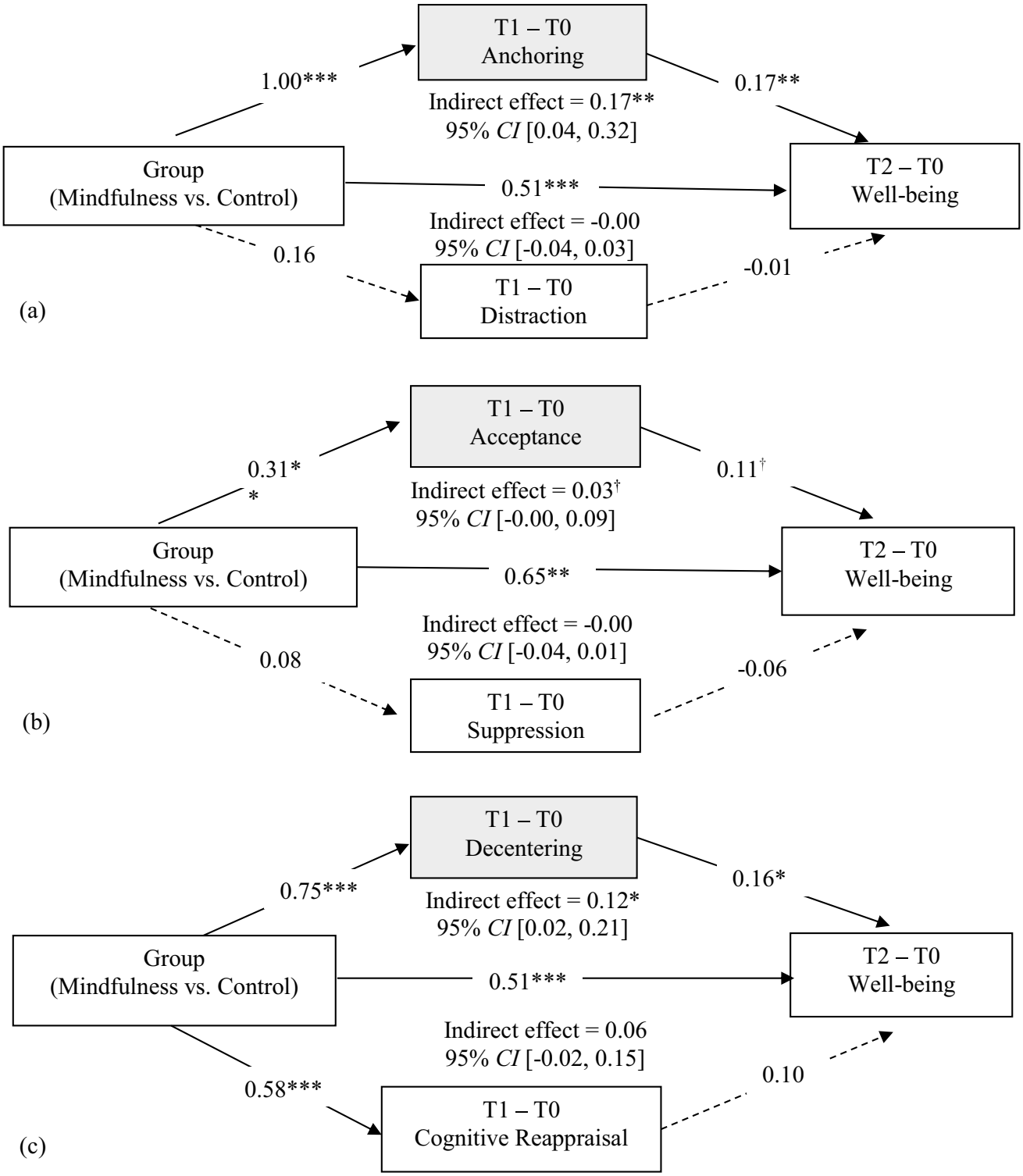
[c]*d* = Cohen's *d*

Fig. 2, the impacts of mindfulness training on well-being were partially mediated by emotion-care strategies (i.e., anchoring, decentering, and acceptance), but not emotion-regulation strategies (i.e., distraction, cognitive reappraisal, and suppression).

Discussion

While many researchers (e.g., Barnhofer et al., 2021; Duraney et al., 2022; Fisher et al., 2022; Goldin & Gross, 2010; Goldin et al., 2017; Kuo et al., 2021) have tried to understand the underlying mechanisms of mindfulness with the process model of emotion regulation (Gross, 1998), we believe that this cognitivist or top-down model cannot fully encompass the unique mechanisms of mindfulness. The applicability of emotion-regulation strategies (distraction, suppression, and cognitive reappraisal) in mindfulness remains uncertain because of the concerns in both logical coherence and empirical evidence. Instead, we speculate that emotion-care strategies (anchoring, acceptance, and decentering) may better explain how and why mindfulness works. With longitudinal data from a randomized controlled trial, we tested which set of strategies can account for the effects of mindfulness training on participants' well-being.

In response to our first hypothesis about the effects of mindfulness training, we found that participants in the experimental group had significantly better general health, more positive affect, and higher life satisfaction, as well as significantly less stress, and less negative affect than their counterparts in the control group after the mindfulness training. The intervention also had significant effects on all three emotion-care strategies. Participants in the experimental group reported more frequent use of anchoring, acceptance, and decentering than their counterparts in the control group after the mindfulness training. In contrast, the mindfulness training did not have similar effects on two emotion-regulation strategies (distraction and suppression). However,



Note. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, †$p \leq 0.06$
Mediation models investigating the indirect effects of (a) anchoring and distraction, (b) acceptance and suppression; and (c) decentering and cognitive reappraisal, respectively, on the influences of mindfulness on well-being.

Fig. 2 Three parallel multiple mediation analyses of emotion care and regulation strategies usage on the effects of mindfulness on well-being

participants in the experimental group reported more frequent use of cognitive reappraisal after the mindfulness training.

In response to our second hypothesis about which set of strategies is a mechanism that explains the effectiveness of mindfulness on well-being, we found that the mediation effects of anchoring and decentering were significant whereas the mediation effect of acceptance was near significant. In contrast, none of the three emotion-regulation strategies mediated the effects of mindfulness training on the participants' well-being.

Most of our findings were consistent with our hypotheses. These findings are also consistent with those of some past studies. For example, Fisher et al. (2022) found that trait mindfulness was related to reduced use of distraction and suppression strategies. Barnhofer et al. (2021) found reduced dorsolateral prefrontal cortex activation in participants, an indicator of less engagement in elaboration or suppression after mindfulness training. Duraney et al. (2022) found that participants in mindfulness training group used acceptance more frequently than their counterparts in cognitive therapy group and waitlist control group. Wisener and Khoury (2022) found that dispositional mindfulness was negatively associated with non-acceptance of emotional responses. Goldin et al. (2017) found that the cognitive-behavioral therapy produced greater increases in cognitive reappraisal of anxious thoughts/feelings whereas MBI produced greater acceptance of anxiety. The findings of these past studies converged with those of the current study, providing evidence to support emotion-care strategies, instead of emotion-regulation strategies, as a mechanism that explains the effectiveness of mindfulness on well-being.

Although these previous studies suggested that emotion-regulation strategies might not be applicable to mindfulness, there is still a strong tendency in the field to understand and explain mindfulness in terms of existing cognitive models such as the process model of emotion regulation (Gross, 1998). While anchoring is considered one type of attention deployment strategy (Goldin & Gross, 2010), acceptance is classified as a specific cognitive stance (Goldin et al., 2019). Similarly, decentering is conceptualized as a multifaceted cognitive process related to attention (Goldin et al., 2019) or even a form of cognitive reappraisal (Gross, 2015). Recently, Raugh and Strauss (2023) simply described mindfulness as "a hybrid strategy characterized by both attentional deployment and cognitive change" (p. 6). In view of the prevalence of cognitive operationalizations of mindfulness, Chambers et al. (2009) have cautioned that doing so risks distorting and substantially curbing the potential contributions of mindfulness to mainstream psychology.

A major contribution of the current study is offering evidence for an alternative to cognitivist or top-down models in understanding the mechanisms of mindfulness. By comparing the strategies of emotion regulation and emotion care, we unveil the possibilities beyond the cognitivist tradition and enrich the existing understanding of mindfulness. Our data showed that emotion care, instead of emotion regulation, might be a mechanism that explained the effects of mindfulness on well-being. However, it is notable that our data also showed that mindfulness training engendered more frequent use of cognitive reappraisal despite no evidence for its mediation effects between mindfulness training and well-being. This result may be due to the intricate relationship between cognition and emotion.

Top-down and bottom-up approaches are not necessarily antagonistic to each other. There are complex reciprocal influences between cortical (higher-order) and subcortical (lower-order) regions (Okon-Singer et al., 2015). It is likely that thinking can influence emotion and vice versa. In a typical 8-week mindfulness curriculum, the practices of anchoring and acceptance in the first several weeks pave way for the practice of decentering that is introduced in the mid-course. Although cognitive reappraisal is not specifically taught, it is plausible that the practices of anchoring, acceptance, and decentering, which result in decreased emotional reactivity, may potentially enhance cognitive reappraisal. In a study to test the mindfulness-to-meaning theory, Garland et al. (2017) found that increases in decentering mediated the effect of mindfulness training on broadening awareness, which in turn enhanced reappraisal efficacy. This may explain why we found more frequent use of cognitive reappraisal by participants after mindfulness training.

Limitations and Future Directions

According to the mindfulness-to-meaning theory (Garland et al., 2017), mindfulness training increases decentering, which in turn broadens awareness, which is then associated with positive reappraisal, ultimately promoting well-being. However, the data in our study did not show the positive association between cognitive reappraisal and well-being. As a result, cognitive reappraisal did not have a mediation effect between mindfulness training and well-being in the current study. Compared to the study of Garland et al. (2017), we did not have longitudinal data to track down the reciprocal changes in the relationship between mindfulness and cognitive reappraisal. This is one of the limitations of the current study. To ascertain the role of cognitive reappraisal in mindfulness as suggested by the mindfulness-to-meaning theory, there is a need to conduct more randomized controlled trials with longitudinal design to track down the influences of mindfulness on decentering, then cognitive reappraisal, and ultimately well-being.

Another limitation of the current study is its reliance on self-report measures. Although self-report is needed considering the subjective nature of the well-being, and cognitive

and emotional processes of interest, this inevitably poses a threat to its internal validity. As Young et al. (2018) pointed out, it may restrict the capacity to decouple the effects of training from participants' beliefs and expectations after learning about the theoretical rationale of the intervention. It is very likely that the rationale is discussed during the psychoeducational portion of the training. To address this limitation, one possibility is to integrate objective techniques, like neuroimaging, alongside self-report methods in robust trial designs that facilitate the exploration of causal pathways. Another direction is to use a mixed-methods approach including a qualitative component with interpretative and/or reflexive analysis in future research, to allow triangulation of findings.

Although the current study is a randomized controlled trial, it did not include an active control group. As indicated in the meta-analysis conducted by Goldberg et al. (2018), the effect size of MBIs depends on the nature of control group. They found that the effect size was moderate in designs that used a waitlist control group and small for design with an active control group. Furthermore, when the active control group received evidence-based treatment, the effect size was reduced to almost zero. To investigate the effects and mechanisms of mindfulness, it is important for future studies to include an active control group. Given the debate on the applicability of cognitivist or top-down models in mindfulness, cognitive group therapy will be a promising candidate for active control group.

Finally, the lack of experimental manipulation of mediators might also be a limitation of the current study. Pirlott and Mackinnon (2016) argue that when participants are not randomly assigned to levels of the mediating variables, the relationship between the mediating and dependent variables is only correlational instead of causal. If experimental manipulation of mediators is possible, future studies may be more rigorous in their identification of causal mechanisms.

All the three parallel multiple mediation analyses in the current study indicated partial mediation effects of the three emotion-care strategies in the influences of mindfulness training on well-being. The lack of full mediation effects suggests that these strategies are only some of the mechanisms that explain the effects of mindfulness. There are more mechanisms other than those of emotion regulation or emotion care. The endeavors to understand the mechanisms of mindfulness is a continuing process that requires more rigorous studies along the way.

While the search for the mechanisms underlying the effectiveness of mindfulness is a continuing process, the results of the current study offer mental health professionals an alternative to the top-down model, a widely accepted model in the field. This enables them to go beyond the emotion-regulation strategies and optimize their MBI outcomes with emotion-care strategies.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12671-024-02471-x.

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Data Availability The data that support the findings of this study are available upon request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Declarations

Ethics Approval This study was approved by the University of Hong Kong's Human Research Ethics Committee (reference number: EA1908007).

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

Conflict of Interest The authors declare no competing interests.

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Use of Artificial Intelligence Artificial intelligence was not used.

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