

Long-term beneficial effects of an online mind-body training program on stress and psychological outcomes in female healthcare providers

A non-randomized controlled study

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Abstract

Mind-body training (MBT) programs are effective interventions for relieving stress and improving psychological capabilities. To expand our previous study which demonstrated the short-term effects of an 8-week online MBT program, the present study investigated whether those short-term effects persist up to a month after the end of the intervention.

Among previous participants, 56 (64%) participated in this follow-up study, 25 in the MBT group and 31 in the control group. Outcome measures included the stress response, emotional intelligence, resilience, coping strategies, positive and negative affect, and anger expression of both groups at baseline, at 8 weeks (right after the training or waiting period), and at 12 weeks (a month after the training or waiting period).

The MBT group showed a greater decrease in stress response at 8 weeks, and this reduction remained a month after the end of the intervention. The effect of MBT on resilience and effective coping strategies was also significant at 8 weeks and remained constant a month later. However, the improvement to emotional intelligence and negative affect did not persist a month after training.

These findings suggest that the beneficial short-term effects of MBT may last beyond the training period even without continuous practice, but the retention of these benefits seems to depend on the outcome variables. Through a convenient, affordable, and easily accessible online format, MBT may provide cost-effective solutions for employees at worksites.

Abbreviations: CDRS = Connor–Davidson Resilience Scale, KOSS = Korean Occupational Stress Scale, MBT = mind-body training, RM ANOVA = repeated measures analysis of variance, SRI = stress response inventory, T0 = Time 0, baseline, T1 = Time 1, right after the 8-week program offset, T2 = Time 2, a month after the 8-week program offset.

Keywords: coping strategy, meditation, mind-body training, resilience, stress, workplace stress reduction

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1. Introduction

Mind-body training (MBT) is an integrative psychological intervention based on meditation for reducing the stress response and facilitating interactions between the brain, mind, body, and behavior.^[1,2] The main feature of MBT is movement-based mindfulness meditation. Incorporating physical and emotional relaxation and deep breathing exercises, MBT was designed to focus on bodily sensations, enhance relaxation, and release negative emotions.

Previous studies have reported on the psychological and physiological benefits of MBT. Mindfulness meditation has been shown to have a positive effect on anxiety, anger, overall stress symptoms, and mood disturbances in patients with various medical conditions^[3–7] as well as in healthy adults.^[1,8,9] Moreover, mindfulness meditation is effective in enhancing coping skills, increasing subjective well-being, and inducing favorable immune function changes.^[10–12] Based on the growing body of evidence in the clinical literature, MBT is currently being employed in stress management programs in large corporations including Google, Ford, and Intel, because of its potential to improve self-reported mood, well-being, and resilience to stress.^[13,14]

Given the limitations of time and space at the worksite, online MBT may be more helpful than traditional face-to-face group training as it is more accessible, more convenient, and less costly.

A systematic literature review and meta-analysis of Internet-based psychotherapeutic interventions has suggested that the efficacy of online interventions is similar to that of offline ones.^[15] Our previous study applied an 8-week online MBT program with female healthcare providers and found that MBT relieves the stress response, increases emotional intelligence, enhances resilience, improves the use of effective coping strategies, and decreases anger and negative affect. Other studies have also found short-term beneficial effects of online MBT on stress reduction.^[16,17] However, the long-term effects of such training have rarely been investigated.^[18]

We conducted a follow-up study to explore whether the short-term effects of online MBT training remained a month after the end of the intervention. In the previous study, we recruited 2 groups of participants^[11]: the MBT group used the 8-week online MBT program, and the control group had an 8-week waiting period. Psychological measures such as stress response, emotional intelligence, resilience, coping strategy, affect, and anger expression were obtained before the beginning of the study and at 8 weeks (after the training or waiting period). In the current study, we followed up at 12 weeks (a month after the training or waiting period) and obtained the same outcome measures, tracking the changes and examining the stability of the previously reported short-term benefits.

2. Methods

2.1. Participants

In the previous study,^[11] 87 participants were recruited separately from Seoul National University Hospital (Fig. 1). None of the participants had a history of head trauma, neurological disease, and psychosis. Psychological measures were obtained from both groups at baseline, 8 weeks (right after the end of the training or waiting period) in the previous study, and 12 weeks (a month after the end of the training or waiting period) in the current study. Among the previous participants, 4 in the MBT group and

3 in the control group were lost to follow-up at 12 weeks (Fig. 1). In addition, 2 participants (1 in each group) conducted but failed to complete the measurements at 12 weeks. A further 12 participants in the MBT group and 10 in the control group were excluded from analyses because they reported having practiced meditation after the training or waiting period. Thus, 56 participants were included in our analyses, 25 in the MBT group and 31 in the control group. This study was approved by the Institutional Review Board at Seoul National University Hospital (Seoul, South Korea) and written informed consent was obtained from all participants.

2.2. MBT program procedure

The online MBT program in this study incorporates MBT content and skills that are beneficial against stress, help produce a positive affect,^[1,12] and enhance brain structure and function.^[19–22] Those in the experimental group participated individually in the program at home or at their workplace for 8 weeks, once per day, 5 days a week, with each session lasting 10 minutes. The techniques were demonstrated by MBT experts in a video, and the participants then followed the protocol for each 10-minute program. The program consists of 10 phases: brain relaxation exercise 1, brain relaxation exercise 2, brain rejuvenation exercise, relaxation breathing, chest breathing, meditation with self-watching, energy-focused meditation, brain-refreshing meditation, meditation for balanced brainwaves, and meditation for emotional release.

2.3. Psychological measures

In our study, the level of occupational stress was measured using the Korean Occupational Stress Scale (KOSS). The KOSS consists of 8 subscales (physical environment, job demands, insufficient job control, job insecurity, interpersonal conflict, organizational system, lack of reward, and occupational climate).

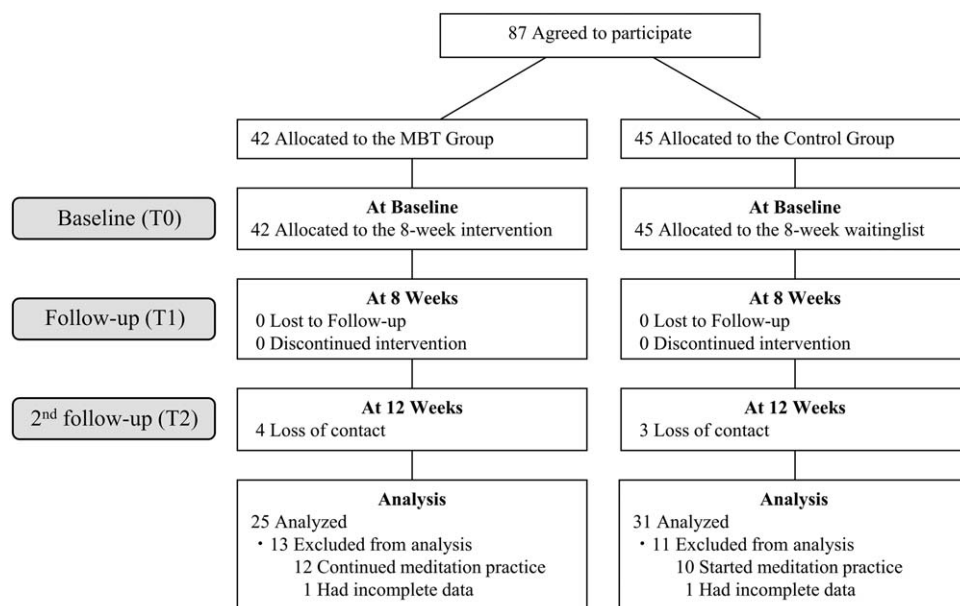


Figure 1. Flowchart of the study population. MBT=mind-body training; T0=baseline, T1=8 weeks, T2=12 weeks.

Participants' stress responses were assessed with the Stress Response Inventory (SRI). The SRI consists of 39 items classified into 7 categories (fatigue, tension, frustration, anger, depression, somatization, and aggression).

Emotional intelligence was assessed using the Korean version of the Emotional Intelligence Questionnaire. This instrument consists of 5 factors (emotional perception and expression, empathy, emotional thinking, emotional application, and emotion regulation), with each factor including 10 questions.

The Korean version of the Connor–Davidson Resilience Scale (CDRS) consists of 5 subfactors (tenacity for high standards, strength for overcoming stress, positive acceptance, control for purpose, and spiritual influences).

The Korean version of the Coping Strategy Indicator evaluated coping strategies. This consists of 3 fundamental domains of coping: problem solving, social support seeking, and avoidance.

The Korean version of the Positive Affect and Negative Affect Schedule was used to measure positive and negative affect. This scale comprises 10 positive (interested, alert, attentive, excited, enthusiastic, inspired, proud, determined, strong, and active) and 10 negative affective descriptors (distressed, upset, guilty, ashamed, hostile, irritable, nervous, jittery, scared, and afraid).

The Korean version of the State-Trait Anger Expression Inventory was used to determine latent classes of anger symptoms, based on a 10-item scale, to measure the intensity of anger as an emotional state and individual differences in anger proneness as a personality trait.

2.4. Statistical analysis

Statistical analyses were performed using SPSS software (ver. 23.0; IBM corp., Armonk, NY). We conducted per-protocol analyses of the 56 participants (25 in the MBT and 31 in the control group) who completed the follow-up assessment at 12 weeks. Independent *t*- and chi-squared tests were used to compare between-group differences in baseline characteristics. To examine the difference in changes of outcome measures between the 2 groups over time, we conducted repeated measures analysis of variance (RM ANOVA) with time as a within-subject factor and group as a between-subject factor. Subsequent tests of within-subject contrasts (time \times group) were carried out to identify the effects of MBT (baseline [T0] vs right after the 8-week program offset [T1]) and its lasting effects after detraining (baseline [T0] vs a month after the 8-week program offset [T2]). *P*-values $<.05$ were considered statistically significant.

3. Results

The demographic characteristics of the participants are shown in Table 1. No significant difference was found in terms of age, education, stress response, emotional intelligence, resilience, coping strategy, positive or negative affect, or anger expression at baseline (for mean scores, see Table 2).

3.1. Occupational stress

The RM ANOVA of occupational stress showed no time \times group interaction effect (Table 2), indicating that occupational stress in the work environment remained similar in the 2 groups across time. The main effect of time was significant ($F=5.26$, $t=0.007$), showing that occupational stress increased in both groups (T0 vs T1: $P=0.008$; T0 vs T2: $P=0.021$). In contrast, there was no main effect of group ($F=0.66$, $t=0.419$), indicating no significant

Table 1
Demographic characteristics of participants.

| | MBT group (n=25) | Control group (n=31) | <i>T</i> / χ^2 | <i>P</i> ^a |
|-----------------------|------------------|----------------------|---------------------|-----------------------|
| Age, y | 36.20 (8.17) | 35.00 (6.74) | 0.603 | .549 |
| Education, y | 16.16 (1.18) | 15.24 (2.29) | 1.94 | .059 |
| Marital status, n (%) | | | 0.984 | .606 |
| Married | 17 (68.0%) | 21 (67.7%) | | |
| Single | 8 (32.0%) | 10 (32.3%) | | |
| Divorced | — | — | | |

Data are given as the mean (standard deviation) except for marital status. MBT = mind-body training. ^a Chi-square for nominal variables and *t* test for continuous variables.

difference between the 2 groups in occupational stress at either baseline ($P=.527$), 8 weeks ($P=.683$), or 12 weeks ($P=.306$) (Fig. 2A).

3.2. Stress response

A significant time \times group interaction was found in total stress level when comparing T0 versus T1 and T0 versus T2 (Table 2), demonstrating that the MBT group had a greater decline in stress response than the control group at both 8 weeks and 12 weeks (Fig. 2B). The same pattern was observed for depression, one of the subscales of stress response, providing evidence for the lasting effect of MBT on alleviating depression. In contrast, tests on fatigue, tension, frustration, anger, somatization, and aggression showed a significant interaction only in T0 versus T1, suggesting that the effect of MBT on these factors weakened over time.

3.3. Emotional intelligence

The time \times group interaction was significant only for emotional regulation, a subscale of emotional intelligence (Table 2). The contrast tests for emotion regulation showed significant interactions between T0 and T1, but not between T0 and T2, indicating that the effects of MBT on emotion regulation were temporary. The same was true of the total score of emotional intelligence. The other subscales showed no significant interactions.

3.4. Resilience

A time \times group interaction was found for the total resilience score and one of its subscales, strength for overcoming stress (Table 2). Contrast tests on the total score detected an interaction between T0 and T1, but not between T0 and T2, suggesting a greater increase in resilience for the MBT group that was sustained over time (Fig. 2C). The same contrast tests on strength for overcoming stress revealed lasting effects of MBT. The other subscales, such as tenacity for high standards and control for purpose, demonstrated short-term but not lasting effects of MBT. No differences in positive acceptance or spiritual influences were observed between the 2 groups over time.

3.5. Coping strategy

Among the 3 types of coping strategy, a time \times group interaction was observed only in social support seeking (Table 2). Contrast tests revealed significant T0 versus T1 and T0 versus T2 interactions, suggesting the long-term effects of MBT. Problem solving differed between the 2 groups in the comparison of T0 versus T1, but not T0 versus T2, indicating that the effects of MBT weakened over time. Avoidance showed no difference between the 2 groups over time.

Table 2
Differences in psychological outcomes for the 2 groups at 3 time points.

| | MBT (n=25) | | | Control (n=31) | | | Time × Group | | Time × Group across time (P) | |
|--------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|-------------|------------------------------|-------------|
| | T0 | T1 | T2 | T0 | T1 | T2 | F | P | T0-T1 | T0-T2 |
| Occupational stress | | | | | | | | | | |
| Total score | 46.86 (6.29) | 48.84 (5.23) | 48.82 (5.30) | 45.75 (6.66) | 48.24 (5.59) | 47.34 (5.34) | 0.18 | .833 | .756 | .807 |
| Stress response | | | | | | | | | | |
| Fatigue | 4.64 (3.60) | 4.64 (3.09) | 3.96 (2.70) | 4.65 (2.82) | 6.61 (3.78) | 5.77 (3.56) | 3.20 | .045 | .025 | .054 |
| Tension | 3.92 (3.49) | 3.48 (3.11) | 3.16 (2.76) | 3.84 (2.90) | 6.23 (4.18) | 5.00 (3.49) | 3.85 | .024 | .010 | .056 |
| Frustration | 5.20 (5.45) | 4.48 (3.11) | 3.48 (2.95) | 6.19 (4.69) | 8.48 (6.06) | 6.52 (5.20) | 2.87 | .070 | .040 | .146 |
| Anger | 4.04 (3.59) | 3.44 (2.63) | 3.08 (2.58) | 4.23 (3.92) | 6.35 (4.81) | 5.23 (3.92) | 4.41 | .018 | .011 | .051 |
| Depression | 5.80 (5.24) | 4.60 (4.86) | 3.76 (3.83) | 4.74 (4.48) | 7.61 (6.09) | 6.61 (5.43) | 6.72 | .003 | .006 | .004 |
| Somatization | 1.64 (2.00) | 1.12 (1.45) | 1.32 (1.65) | 1.74 (2.22) | 2.97 (2.77) | 2.26 (1.90) | 4.19 | .018 | .005 | .149 |
| Aggression | 0.96 (1.72) | 0.52 (1.26) | 0.32 (0.56) | 1.26 (2.03) | 2.00 (2.35) | 1.32 (1.64) | 3.19 | .045 | .031 | .126 |
| Total | 26.20 (22.76) | 22.28 (15.72) | 19.08 (13.60) | 26.65 (20.23) | 40.26 (27.84) | 32.71 (22.20) | 5.45 | .006 | .006 | .021 |
| Emotional intelligence | | | | | | | | | | |
| Emotional expression | 35.88 (3.22) | 36.36 (4.07) | 35.64 (4.65) | 35.35 (4.59) | 34.03 (3.89) | 33.94 (3.87) | 1.76 | .177 | .077 | .255 |
| Empathy | 35.88 (4.19) | 35.32 (4.79) | 35.92 (4.86) | 34.77 (4.51) | 33.74 (3.77) | 33.65 (3.82) | 0.65 | .524 | .664 | .275 |
| Emotional thinking | 31.04 (3.79) | 32.68 (3.53) | 33.12 (5.09) | 32.29 (4.50) | 31.87 (3.48) | 32.35 (3.49) | 2.08 | .141 | .104 | .134 |
| Emotional application | 32.36 (5.26) | 33.28 (4.48) | 33.32 (5.77) | 31.58 (5.18) | 31.52 (3.86) | 31.74 (3.43) | 0.50 | .608 | .339 | .485 |
| Emotional regulation | 31.40 (4.12) | 33.12 (4.48) | 32.48 (4.29) | 33.32 (4.72) | 32.32 (3.79) | 33.16 (4.06) | 4.24 | .017 | .012 | .174 |
| Total | 166.56 (15.66) | 170.76 (15.95) | 170.48 (21.13) | 167.32 (16.61) | 163.48 (14.92) | 164.84 (14.90) | 2.56 | .082 | .036 | .112 |
| Resilience | | | | | | | | | | |
| Tenacity for high standards | 25.28 (3.96) | 26.72 (4.85) | 26.08 (4.44) | 24.58 (3.97) | 23.74 (3.74) | 23.81 (4.56) | 2.86 | .068 | .013 | .170 |
| Strength for overcoming stress | 19.64 (3.05) | 21.80 (3.89) | 21.36 (3.26) | 20.23 (3.88) | 19.61 (3.39) | 19.61 (3.24) | 6.57 | .002 | .002 | .007 |
| Positive acceptance | 17.48 (2.69) | 17.32 (2.29) | 17.64 (2.22) | 16.94 (2.17) | 16.19 (2.07) | 16.55 (2.58) | 0.71 | .492 | .250 | .362 |
| Control for purpose | 9.28 (1.88) | 10.08 (2.18) | 9.88 (1.90) | 9.26 (1.75) | 8.87 (1.63) | 9.00 (1.79) | 3.49 | .034 | .019 | .081 |
| Spiritual influences | 6.48 (1.61) | 6.80 (1.22) | 7.24 (1.13) | 5.87 (0.96) | 6.07 (1.03) | 6.23 (0.99) | 0.96 | .385 | .673 | .226 |
| Total | 78.16 (10.31) | 82.72 (11.85) | 82.20 (10.72) | 76.87 (10.95) | 74.48 (9.99) | 75.19 (10.97) | 5.48 | .005 | .002 | .025 |
| Coping strategy | | | | | | | | | | |
| Social support seeking | 22.64 (4.72) | 23.20 (4.48) | 24.60 (4.10) | 25.19 (5.49) | 23.10 (3.65) | 23.87 (4.79) | 4.25 | .017 | .028 | .019 |
| Problem-solving | 21.76 (4.68) | 23.28 (4.70) | 22.80 (3.92) | 22.19 (5.82) | 21.23 (4.51) | 21.97 (5.75) | 1.75 | .178 | .048 | .386 |
| Avoidance | 16.36 (2.75) | 16.60 (2.60) | 17.60 (3.16) | 16.16 (3.45) | 16.87 (3.36) | 16.68 (2.88) | 1.20 | .304 | .529 | .374 |
| Positive and negative affect | | | | | | | | | | |
| Positive affect | 24.60 (6.34) | 26.44 (6.05) | 28.08 (4.94) | 24.84 (5.30) | 26.35 (6.03) | 26.07 (4.21) | 1.09 | .339 | .864 | .127 |
| Negative affect | 21.84 (5.37) | 20.60 (4.73) | 23.04 (4.49) | 21.48 (5.95) | 23.65 (6.98) | 23.81 (8.13) | 2.29 | .106 | .020 | .517 |
| Anger expression | | | | | | | | | | |
| State anger | 11.40 (1.94) | 11.20 (2.33) | 10.96 (1.37) | 11.68 (2.84) | 12.42 (3.38) | 11.35 (2.55) | 1.02 | .363 | .169 | .873 |
| Trait anger | 19.64 (4.70) | 18.88 (4.39) | 17.64 (4.87) | 19.23 (4.63) | 19.81 (5.01) | 20.45 (6.33) | 0.372 | .034 | .193 | .025 |

Data are given as the mean (standard deviation).

MBT = mind-body training; T0 = baseline, T1 = 8 weeks, T2 = 12 weeks.

3.6. Affect and anger expression

The time × group interaction of negative affect was significant in the T0 versus T1 comparison but not in T0 versus T2, indicating a

transitory effect of MBT (Table 2). Positive affect did not vary between the 2 groups across time. Among the 2 types of anger expression, a time × group interaction was observed in trait anger but not in state anger. Contrast tests on trait anger revealed a

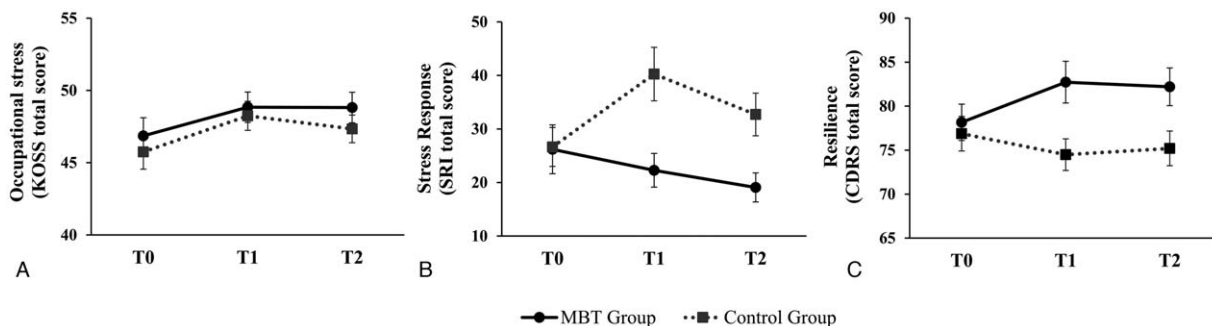


Figure 2. Changes in occupational stress (A), stress response (B), and resilience (C) for the 2 groups across time. CDRS = Connor–Davidson Resilience Scale; KOSS = Korean Occupational Stress Scale; MBT = mind-body training; SRI = stress response inventory.

significant interaction between T0 and T2, which can be interpreted as reflecting that more time is required to produce a significant change in anger expression.

4. Discussion

The present study identifies the long-term stability of the beneficial effects of an 8-week online MBT program on female healthcare providers. Our previous study found a short-term effect on stress response, emotional intelligence, resilience, the use of coping strategies, and negative affect; the current results show that the effects on stress response, resilience, and the use of an adaptive coping strategy lasted for a month after the end of the program, while the effects on emotional intelligence and negative affect were shorter lived.

The therapeutic effects of meditation have been attributed to its potential regulatory functions on attentional and emotional processes.^[23] Meditation leads to a shift in perspective (i.e., re-perceiving or deautomatization), which allows practitioners to look objectively and dispassionately at their emotional state instead of engaging in an automatic negative response (e.g., avoidance manifesting as drinking and smoking).^[24] Through this shift in perspective, cognitive, emotional, and behavioral responses to stressful environment are thought to become more flexible and less automatic.^[23,25–27] Although we did not identify lasting changes in emotional regulation (one of the subscales of emotional intelligence), previous studies have suggested that social support seeking (one of the 3 coping strategies) includes efforts to regulate feelings and actions such as venting, and can therefore be categorized into emotion regulation.^[24,28] Thus, the long-term retention of positive changes in social coping strategies observed in the MBT group may also indicate the regulatory functions of MBT on emotion and attention processes, even when meditation is not being practiced.

Overall, our findings show different effects of MBT on different dependent variables. A previous meta-analysis of the psychological effects of meditation showed that it has the greatest effect on variables related to positive changes in interpersonal relationships, state anxiety, and negative emotions, and the least effect on learning and memory, negative personality traits, and emotion regulation.^[24] The authors raised the possibility that the cognitive measures are relatively less influenced by meditation than the emotional measures are. Moreover, given that in the present study a decrease in trait anger was observed at 12 weeks after training but not at 8 weeks, the time point of measurement seems to contribute to the differential effects of meditation. The types of dependent variables and potential moderating factors in the magnitude and duration of the beneficial effects of MBT should be further explored.

Notably, in the current study, we excluded participants who had continued meditating after the 8-week follow-up or had just started meditation at the time of the 12-week second follow-up so that the long-term MBT effects observed in the current study would not be attributable to ongoing meditation practice. Thus, the findings reflect sustained improvements in the practitioners' diverse psychological capabilities caused by the 8-week MBT training. So far, neuroscientific studies of the long-term impact of meditation have emphasized the plasticity of brain circuits, reporting meditation-related changes in brain function and structures.^[19–22,29] For example, experienced meditators had different brain structure and functional connectivity in the medial prefrontal cortex,^[19,21] which is related to emotion regulation, as well as different brain function in the superior frontal sulcus and

intraparietal sulcus,^[30] which are associated with attentional orienting. In light of this, an integrating review article^[23] underscored the plasticity of the brain circuits that underlie the potential regulatory functions of meditation on attention and emotion processes. Based on these findings, we presume that the plasticity of the human brain may be involved in the long-term effects of MBT.

Several limitations in the present study should be mentioned. First, our method of recruiting participants (i.e., voluntary participation) did not guarantee random variation in the MBT and control groups. However, as there were no significant differences in the groups' demographics or psychological measures, we believe that the observed results were not affected by potential confounding variables. Second, our findings are restricted to female subjects. Although meditation training programs improve depressive symptoms regardless of sex,^[31] sex differences in the MBT effect must be further investigated in future studies.

In conclusion, the findings of the present study provide evidence for the long-lasting beneficial effects of an 8-week online MBT course on various psychological capabilities, and the retention of these benefits seems to vary according to the outcome measurement. Through a convenient, affordable, and easily accessible online format, MBT can provide cost-effective solutions for employees at worksites.

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