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

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.\textsuperscript{[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\textsuperscript{[3–7]} as well as in healthy adults.\textsuperscript{[1,8,9]} Moreover, mindfulness meditation is effective in enhancing coping skills, increasing subjective well-being, and inducing favorable immune function changes.\textsuperscript{[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.\textsuperscript{[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.\(^1\)\(^2\) 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.\(^1\)\(^6\),\(^1\)\(^7\) However, the long-term effects of such training have rarely been investigated.\(^1\)\(^8\)

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\(^1\): 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,\(^1\) 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, 36 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,\(^1\)\(^1\)\(^2\) and enhance brain structure and function.\(^1\)\(^9\)\(–\)\(^2\)\(^2\) 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.](image-url)
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; IMB 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 × 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 a time × 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 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 × 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 × 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 × 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 × 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 1

**Demographic characteristics of participants.**

|                | MBT group (n = 25) | Control group (n = 31) | T2 $^2$ | P     |
|----------------|--------------------|------------------------|---------|-------|
| Age, y         | 36.20 (8.17)       | 35.00 (6.74)           | 0.603   | .549  |
| Education, y   | 16.16 (1.18)       | 15.24 (2.23)           | 1.94    | .168  |
| Marital status, n (%) | 984     | 966                   |        |       |
| Married        | 17 (68.0%)         | 21 (67.7%)             | 0.984   | .306  |
| Single         | 8 (32.0%)          | 10 (32.3%)             |        |       |
| Divorced       | –                  | –                      |        |       |

Data are given as the mean (standard deviation) except for marital status. MBT = mind-body training.

* Chi-square for nominal variables and t-test for continuous variables.
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
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. Meditation leads to a shift in perspective (i.e., reperceiving 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). Through this shift in perspective, cognitive, emotional, and behavioral responses to stressful environment are thought to become more flexible and less automatic. 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. 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. The authors raised the possibility that the cognitive and memory, negative personality traits, and emotion regulatory functions of meditation showed that it has the greatest effect on emotional intelligence, resilience, and 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.

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[9] Kemper KJ, Khirallah M. Acute effects of online mind-body skills training on resilience, mindfulness, and empathy. J Evid Based Complementary Altern Med 2015;20:247–53.
[10] Davidson RJ, Kabat-Zinn J, Schumacher J, et al. Alterations in brain and immune function produced by mindfulness meditation. Psychosom Med 2003;65:564–70.
[11] Greeson JM. Mindfulness research update: 2008. Complement Health Pract Rev 2009;14:10–8.
[12] Jung YH, Kang DH, Jang JH, et al. The effects of mind-body training on stress reduction, positive affect, and plasma catecholamines. Neurosci Lett 2010;479:138–42.
[13] Hartfiel N, Havenhand J, Khalsa SB, et al. The effectiveness of yoga for the improvement of well-being and resilience to stress in the workplace. Scand J Work Environ Health 2011;37:70–6.
[14] McCraty R, Atkinson M, Tomasino D. Impact of a workplace stress reduction program on blood pressure and emotional health in hypertensive employees. J Altern Complement Med 2003;9:355–69.
[15] Barak A, Hen L, Bonel-Nissim M, et al. A comprehensive review and a meta-analysis of the effectiveness of internet-based psychotherapeutic interventions. J Technol Hum Serv 2008;26:109–60.
[16] Pfugiesen BM, Drummond D, Elbersole D, et al. Brief video-module administered mindfulness program for physicians: a pilot study. Explore (NY) 2016;12:50–4.
[17] Spadaro KC, Hunker DF. Exploring the effects of an online asynchronous mindfulness meditation intervention with nursing students on stress, mood, and cognition: a descriptive study. Nurse Educ Today 2016;39:163–9.
[18] Kemper KJ, Rao N, Gascon G, et al. Online training in mind-body therapies: different doses, long-term outcomes. J Evid Based Complementary Altern Med 2017;22:696–702.
[19] Jang JH, Jung WH, Kang DH, et al. Increased default mode network connectivity associated with meditation. Neurosci Lett 2011;487:338–62.
[20] Jung YH, Kang DH, Byun MS, et al. Influence of brain-derived neurotrophic factor and catechol O-methyl transferase polymorphisms on effects of meditation on plasma catecholamines and stress. Stress 2012;15:97–104.
[21] Kang DH, Jo HJ, Jung WH, et al. The effect of meditation on brain structure: cortical thickness mapping and diffusion tensor imaging. Soc Cogn Affect Neurosci 2013;8:27–33.
[22] Luders E, Clark K, Narr KL, et al. Enhanced brain connectivity in long-term meditation practitioners. Neuroimage 2011;57:1308–16.
[23] Lutz A, Slagter HA, Dunne JD, et al. Attention regulation and monitoring in meditation. Trends Cogn Sci 2008;12:163–9.
[24] Sollmeier P, Eberth J, Schwarz M, et al. The psychological effects of meditation: a meta-analysis. Psychol Bull 2012;138:1139–71.
[25] Brown KW, Ryan RM, Creswell JD. Mindfulness: theoretical foundations and evidence for its salutary effects. Psychol Inquiry 2007;18:211–37.
[26] Garland E, Gaylord S, Park J. The role of mindfulness in positive reappraisal. Explore (NY) 2009;5:37–44.
[27] Mitmansgruber H, Beck TN, Höfer S, et al. When you don’t like what you feel: experiential avoidance, mindfulness and meta-emotion in emotion regulation. Pers Indiv Diff 2009;46:448–53.
[28] Chan DW. The Chinese ways of coping questionnaire: assessing coping in secondary school teachers and students in Hong Kong. Psychol Assess 1994;6:108–16.
[29] Lutz A, Brefczynski-Lewis J, Johnstone T, et al. Regulation of the neural circuitry of emotion by compassion meditation: effects of meditative expertise. PLoS One 2008;3:1–10. e1897.
[30] Brefczynski-Lewis JA, Lutz A, Schaefer HS, et al. Neural correlates of attentional expertise in long-term meditation practitioners. Proc Natl Acad Sci USA 2007;104:11483–8.
[31] Greeson JM, Toohey MJ, Pearce MJ. An adapted, four-week mind-body skills group for medical students: reducing stress, increasing mindfulness, and enhancing self-care. Explore (NY) 2015;11:186–92.