Commentary

“Just This Breath…” How Mindfulness Meditation Can Shift Everything, Including Neural Connectivity

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In this issue of EBioMedicine, Shao et al. (2016-in this issue) make a significant and interesting contribution to a growing literature of changes seen in participants who receive formal programmatic instruction in mindfulness meditation. Since Kabat-Zinn’s (1982) paper reporting on what would become the mindfulness-based stress reduction (MBSR) program, the literature and application of mindfulness meditation instruction within the Western biomedical approach has expanded greatly. The initial MBSR program was developed for patients at an academic medical center who had ongoing chronic pain despite maximized allopathic treatment. These participants reported significant reductions in pain, improvements in mood, and fewer medical symptoms (Kabat-Zinn, 1982). Since that time, mindfulness meditation instruction has been applied and, especially MBSR, studied in broadening clinical scenarios, as well as for general health and wellness.

Mindfulness meditation programming is aimed at enhancing participants’ innate capacity for mindfulness, described as “the present moment, held in awareness, non-judgmentally…” (Kabat-Zinn, 2013). (In contrast to mindfulness meditation, concentration meditation is aimed at sustained attention on a single focus or mantra.) Structured mindfulness meditation programs such as that used by Shao et al. and MBSR include didactic and experiential instruction in a number of formal mindfulness practices, practices aimed at strengthening participants’ awareness of their own thoughts, feelings, bodily sensations, inner and outer selves (Shao et al., 2016-in this issue; Kabat-Zinn, 2013). The formal practices offer a variety of approaches, such as sitting meditation, walking meditation, mindful movement, body awareness, etc. During formal practices, participants select a focus for their attention and when they notice that their attention has drifted from the focus, they are directed to bring themselves back to the present task (the practice) with an open and non-judgmental attitude. Through these practice experiences, participants increase their ability to sustain attention and become more aware of their cognitive, affective, and somatic predispositions and habits, as well as the transient nature of thoughts, feelings, and sensations. Interestingly, through these practices and increased awareness over the eight-week programs, participants often become more actively engaged in altering their predispositions and habits, both during formal practice and “off the cushion” in day-to-day and moment-to-moment life, many describing fundamental shifts in awareness and self-regulation (Kabat-Zinn, 2013; Kerrigan et al., 2011). The enhanced awareness itself, with an open and non-judgmental attitude, seems to allow for meta-cognitive changes and opportunities to respond to situations differently than in the past.

The impact of mindfulness instruction on individual experience and investigation of its mechanism has been explored in the biomedical literature through the years. A meta-analysis of 47 actively-controlled trials with 3515 participants showed that participation in mindfulness instruction programming is effective for improving self-reported symptoms of anxiety, depression, and pain (Goyal et al., 2014). In addition to changes in reported in affect and pain, researchers have noted improvements in coping processes, with reductions in rumination, a process in which negative thoughts and scenarios are repeatedly reviewed (Jain et al., 2007; Sibinga et al., 2013). Further, Jain showed that decreases in rumination mediated the beneficial effect of the MBSR program on depressive symptoms (Jain et al., 2007). Physiologic changes have also been described in trials of the eight-week MBSR program, including improvements in the important stress hormone cortisol (Sibinga et al., 2013; Carlson et al., 2004) and in age-related DNA telomere maintenance activity (Schutte and Malouff, 2014).

Previous research has described the effects of eight-week mindfulness meditation instruction on neural connectivity (e.g., Gotink et al., 2016), and Shao further extends this work. The Shao study is a noteworthy contribution, especially related to the rigorous randomized active-control study design, longitudinal approach, and correlation of affective and neural connectivity changes. Shao et al. have chosen a relaxation program control condition in order to discern the effects of meditation instruction beyond non-specific benefits of a positive peer-group activity. The longitudinal nature of the trial further strengthens the findings, as differences in changes between study arms seen postgroup are attributable to the meditation aspect of the intervention. Given these methodological strengths, the authors show salient effects of the eight-week meditation program related to resting state neural connectivity (increased connectivity from the prefrontal cortex to the posterior cingulate cortex (PCC)/precuneus) and affective processing (“neutralizing” affective processing of positive and negative stimuli). Further, the
resting state changes in neural connectivity from pons to PCC/precuneus predicted the changes in affective processing, suggesting that the eight-week meditation program leads to changes in the regulatory neural network both during affective evaluation and at rest. These are notable findings further illustrating the complex interplay between neural connectivity and affective processing. Additional research is needed to examine the clinical implications of this work among elderly patients and to explore the generalizability of the findings to other populations.

**Disclosure**

The author declared no conflicts of interest.

**References**

Carlson, L.E., Speca, M., Patel, K.D., Goodey, E., 2004. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients. Psychoneuroendocrinology 29 (4), 448–474.

Gotink, R.A., Meijboom, R., Vernoij, M.W., Smits, M., Hunink, M.G.M., 2016. 8-week mindfulness based stress reduction induces brain changes similar to traditional long-term meditation practice – a systematic review. Brain Cogn. 108, 32–41.

Goyal, M., Singh, S., Sibinga, E.M., Gould, N.F., Rowland-Seymour, A., Sharma, R., ... Ranasinghe, P.D., 2014. Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. JAMA Intern. Med. 174 (3), 357–368.

Jain, S., Shapiro, S.L., Swanick, S., Roesch, S.C., Mills, P.J., Bell, I., Schwartz, G.E., 2007. A randomized controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination, and distraction. Ann. Behav. Med. 33 (1), 11–21.

Kabat-Zinn, J., 1982. An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: theoretical considerations and preliminary results. Gen. Hosp. Psychiatry 4 (1), 33–47.

Kabat-Zinn, J., 2013. Full Catastrophe Living, Revised Edition: How to Cope with Stress, Pain and Illness Using Mindfulness Meditation. Hachette, UK, p. xli.

Kerrigan, D., Johnson, K., Stewart, M., Magyari, T., Hutton, N., Ellen, J.M., Sibinga, E.M., 2011. Perceptions, experiences, and shifts in perspective occurring among urban youth participating in a mindfulness-based stress reduction program. Complement. Ther. Clin. Pract. 17 (2), 96–101.

Schutte, N.S., Malouff, J.M., 2014. A meta-analytic review of the effects of mindfulness meditation on telomerase activity. Psychoneuroendocrinology 42, 45–48.

Shao, R., Keuper, K., Geng, X., Lee, T.M., 2016. Pons to posterior cingulate functional projections predict affective processing changes in the elderly following eight weeks of meditation training. EBioMedicine 10, 236–248 (in this issue).

Sibinga, E.M., Perry-Parrish, C., Chung, S.E., Johnson, S.B., Smith, M., Ellen, J.M., 2013. School-based mindfulness instruction for urban male youth: a small randomized controlled trial. Prev. Med. 57 (6), 799–801.