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Commentary

Does meditation training lead to enduring changes in the anticipation and experience of pain?

For many years, meditation remained largely outside the purview of scientific research. Clinicians and researchers commonly considered meditation synonymous with reflection or relaxation, if they considered it at all. However, recent years have witnessed a surge in the scientific study of meditation. This remarkable change appears to be the result of at least two factors. First, meditation-based interventions have become widespread in clinical settings [4]. Second, a more sophisticated understanding of the history and cultural context of meditation traditions has lead scientists to conceive of meditation as a kind of cognitive training. While the heterogeneity of meditative techniques obviates any definition that is both simple and inclusive, in general meditation involves the continuous direction of attention towards some aspect of one's present experience. The goal is not to think about the mental or perceptual representations one is attending to, but simply to observe or perceive them without additional mental elaboration. Many forms of meditation place particular emphasis on a nonreactive, nonjudgmental cognitive stance.

In the present issue, Brown and Jones [1] provide novel evidence that long-term meditation training may influence pain processing. They compared ratings of unpleasantness and event-related potentials (ERPs) between meditators and matched controls in a laser-evoked pain paradigm. As in previous studies, pain unpleasantness was lower in the experienced meditators compared to inexperienced meditators and controls, and these ratings negatively correlated with the duration of meditation training. An important and novel contribution of the current study is the use of ERPs to examine the role of anticipatory neural activity. Brown and Jones reasoned that the present-centered, nonreactive attentional stance cultivated in meditation practice might reduce pain-related cognition immediately prior to the noxious stimulus. Indeed, meditators showed lower anticipatory activity in right inferior parietal cortex and midcingulate cortex. Strikingly, the magnitude of this activity correlated with meditation experience. While the present study was not designed to dissociate effects of meditation experience on anticipatory activity, stimulus-evoked activity and pain unpleasantness, these findings argue for the need to consider anticipatory activity in understanding the relationship between meditation experience and pain.

Interestingly, while previous studies primarily examined pain experience during the practice of meditation, meditators in the current study were not instructed to meditate during the task. Thus, although other explanations are possible, the meditation-related differences Brown and Jones observed appear to reflect the long-term effects of meditation training on cognitive abilities and tendencies, rather than transient effects of the meditative state itself. Future work will need to confirm this interpretation by ruling out the possibility that differences in pain processing that stem from other variables are correlated with meditation experience.

If there are effects of meditation training on pain processing, as Brown and Jones' results suggest, then which of the numerous aspects of the training is responsible for these changes? We and many others have demonstrated that attention plays a crucial role in the experience of pain [2]. Directing one's attention towards a painful experience typically increases one's pain, while distraction typically reduces pain. One might thus hypothesize that the enhanced attentional ability cultivated by meditation training would allow one to reduce one's pain by directing attention towards something else. However, this seems unlikely to explain the results of the current study, as participants were explicitly instructed to attend to the unpleasantness of anticipated and experienced pain. Furthermore, the only study we know of that explicitly instructed meditators to direct attention away from their pain reported no reduction in pain intensity or unpleasantness relative to controls [5]. In contrast, several studies have found reductions in pain or pain-related brain activity when practitioners were instructed to attend to pain with a nonreactive and nonjudgmental mindset [3,5,6]. Together, these results support the idea that it is not just whether we attend to somatic sensations but also how we attend to them that determines pain experience, and that meditation practice may have particularly pronounced effects on the latter quality of attention.

The present finding that only experienced meditators showed changes in pain anticipation and experience is consistent with previous studies that found that thousands of hours of practice are required to produce changes in pain processing [3,5]. These results might give pause to clinicians interested in using meditation-based interventions in the treatment of chronic pain. However, other evidence is more hopeful. For example, in another recent study, participants reported reduced pain after only three 20 min training sessions [6]. Perhaps more importantly, numerous studies have shown pain meditation-related reductions in chronic pain patients. One possible explanation for these discrepant findings is that meditators can more easily and effectively apply their training to the pain experience under study. While meditation training is typically designed to be applicable to an infinite diversity of circumstances, the context of experimentally evoked pain in a laboratory is likely quite different from the standard meditation environment. Perhaps novice meditators are unable to generalize their training with the flexibility of expert meditators. On the other hand, training programs given in the context of a pain laboratory or clinic may be designed specifically to apply to pain, and individuals who learn meditation in these contexts may more readily apply the training to their pain experience. Resolving these questions will be critical

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for developing clinical meditation training regimens that yield clinically meaningful reductions in pain in a clinically applicable timeframe.

We hope that the exciting results of Brown and Jones inspire future studies that examine the pain-reducing effects of meditation. Additional work is needed to build on their findings, by assessing whether both anticipatory activity and stimulus-evoked activity are affected by meditation training and determining whether these brain processes independently or jointly mediate reduced pain. This avenue of research offers a unique opportunity to illuminate the cognitive processes that contribute to and mitigate pain experience.

Conflict of interest

The authors declare no conflict of interest.

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