Biological Psychiatry

Stepping Out of the Palace of Luxury: Mindfulness and Modern Psychiatry

AZA Stephen Allsop, Hassan W. Chaudhry, Andrew M. Novick, and David A. Ross

To bear trials with a calm mind robs misfortune of its strength and burden.

—Seneca

The Buddha was raised in a palace of luxury and grandeur. According to tradition, he did not leave the palace until he was 29 years old. When he finally ventured out, he encountered things he had never seen—sickness, old age, death—and was confronted with the harsh reality of impermanence and suffering. He later met an ascetic who was deep in meditation and said to be on the path to understanding the ultimate truth. Based on these experiences, the Buddha went on to develop "The Noble Eightfold Path." Central to this approach was the practice of mindfulness—a nonjudgmental awareness of what one is paying attention to in every moment—be it breath, sounds, sights, moods, sensations, or thoughts.

Of course, the Buddha wasn't alone in these ideas. Meditation practices exist within the Abrahamic religions, Hinduism, Sikhism, Jainism, and various indigenous spiritual traditions—all of which include mindfulness as a path toward increased self-realization, fulfillment, and transcendence of suffering.

Yet, in modern America, many prominent voices advocating for mindfulness and meditation are not religious figures but entrepreneurs. Meditation has become fodder for various fads, money-making schemes, and an entire industry that is positioned as an alternative to Western medicine. While some of these incarnations are clearly meant to be secular in nature, at their core they remain rooted in spiritual traditions that are millennia old. How can we reconcile an ancient practice with a modern neuroscience perspective?

It is only in recent years that academics have begun to rigorously study the topic, starting with the most basic questions: Does meditation change the brain? And, if so, in what ways?

Some of the earliest research in this space started with a skeptical Harvard graduate student and a back injury. When Sara Lazar entered her first yoga class, she was just looking for a way to relieve her pain so she could run the Boston Marathon. When the instructor talked about the benefits of focus and breathing, "[her] eyes would roll." But as her Ph.D. work became increasingly stressful, she found herself feeling "calmer, more compassionate, and less reactive" (1). She started to wonder, *What if all this mindfulness stuff is real?*

Lazar and her team began by recruiting a group of experienced meditators and healthy control subjects and then conducted a combination of structural and functional imaging studies. In one study they compared structural magnetic resonance imaging scans and found widespread differences between experienced meditators and control subjects, including increased cortical thickness in the prefrontal cortex (relating to attention) and the insula (relating to interoception and sensory processing) (Figure 1). They also looked at which regions of the brain are functionally active during meditation by imaging experienced meditators and comparing brain activation when meditating versus generating a list of animals. Through this work they found a specific pattern of activity in regions related to arousal control, affect regulation, and physiological homeostasis (see Figure 1).

While interesting, these results still left open a question of causation. Are brain differences in experienced meditators due to meditation, or something else inherent in people who choose to pursue this skill? To address this question, they recruited a group of inexperienced individuals and trained them to meditate. Remarkably, they found that similar structural and functional changes developed over time that were comparable to those of experts (2). Lazar's work offered a first step toward reconciling meditation with a modern neuroscience perspective. The stage was now set for a deeper dive into specific mechanisms.

Jud Brewer has a similar neuroscience origin story. Like Lazar, Brewer was a stressed-out graduate student when he first encountered meditation. Also like Lazar, Brewer was initially skeptical, finding it tedious and exhausting. But, over time, he came to appreciate the value of *non-distracted focus*. The timing of his experience turned out to be crucial. For the first decade of functional imaging work, researchers had relied on resting conditions as a control, assuming that the brain was relatively inactive. Then in 2001, Marcus Raichle and his group at Washington University in St. Louis published a landmark paper demonstrating that the brain was never "at rest" (3). Rather there is an active network associated with mind wandering, daydreaming, and ruminating—what became known as the default mode network (DMN). Knowing that a *wandering mind is an unhappy mind*, Brewer wondered if this could be the active ingredient for *how* mindfulness works, both acutely and on an ongoing basis. So Brewer recruited a group of experienced meditators and meditation-naïve control subjects and gave them both brief instructions for meditation. When the experienced meditators engaged in meditation, they reported significantly less mind wandering compared with the control group and showed a corresponding decrease in DMN activity. But there was something even more interesting: the experienced meditators showed differential functional connectivity in the DMN compared to controls *regardless of what they were doing* (4). Which is to say, the practice of mindfulness seemed to correlate with persistent changes to core neural networks. The question was no longer *whether* meditation was a

https://doi.org/10.1016/j.biopsych.2022.05.015
ISSN: 0006-3223

brain-based intervention, but rather, to what extent these changes impact psychiatric functioning.

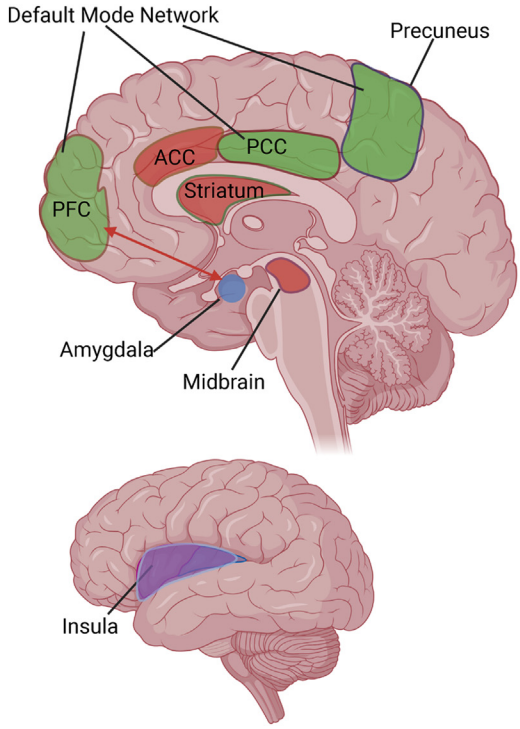
The question is deceptively difficult to answer. How do you study something that exists in so many different forms? Bringing meditation to the clinic would require the creation of a standardized intervention. The solution followed from a now familiar story. Amidst the chaos of the Vietnam War, Jon Kabat-Zinn was a graduate student in biology when he attended a seminar on Buddhist meditation. He too became hooked. Over time he became convinced that it was his "karmic assignment" to bring mindfulness to the masses (5). He went on to devise an 8-week training program called mindfulness-based stress reduction (MBSR). The program had many elements of traditional and religious forms of meditation but with the advantage (at least from a research agenda) of being secular and portable, thereby allowing rigorous testing in clinical populations.

MBSR ultimately paved the way for a range of other standardized interventions, such as mindfulness-based cognitive therapy (MBCT). Forty years later, there have now been hundreds of clinical trials using these approaches. Meta-analyses demonstrate efficacy for both mood and anxiety disorders. There is also preliminary evidence suggesting benefits for obsessive-compulsive disorder, substance use disorders, and eating disorders (6).

The success of MBSR is very much related to its portability: its manualization made it easy for clinicians to quickly learn and apply it to their patients. In the 21st century, portability has taken on a whole new life through the smartphone. Ironically, it appears that we may now be able to convert the archetypal instrument of mindlessness into its opposite. Emerging data suggest that mindfulness training apps may be effective across a range of psychiatric illnesses, including generalized anxiety disorder and nicotine use disorder. And, at least in nicotine use disorder, the mechanism seems to be exactly what we already knew: changes in functioning of the DMN (7,8).

And yet, despite a strong evidence base, mindfulness remains at the fringe of standard psychiatric practice (at least within the U.S.). Why? Much of it may have to do with how it is perceived in our culture. Perhaps because of the insidious impact of dualism—in which mind and brain are treated as separate—something called *mind*fulness seems antithetical to biological psychiatry (9). Similarly, there may be a tension between modern medicine and an intervention that is connected to spiritual traditions (especially when it is enthusiastically embraced by New Age gurus). The litmus test for modern medicine shouldn't be whether it conforms to our preconceived beliefs but rather whether it is effective.

There are also practical barriers. U.S. medicine has evolved to be a sick-care system, designed to treat people when they are in crisis rather than investing in preventive, ongoing health interventions, even if they would have dramatic long-term benefits (10). As exposed through recent court cases (e.g.,



Meditation induced brain change	Proposed benefit
Decreased functional connectivity in default mode network (PFC, PCC, precuneus)	Decreased mind wandering
Increased activation of ACC and striatum	Attention and emotion regulation
Increased activation of midbrain	Regulation of arousal
Decreased activation of amygdala, increased PFC integration with amygdala	Emotion regulation
Increased cortical thickness of insula	Interoception, sensory processing

Figure 1. Brain regions influenced by mindfulness meditation and their proposed benefits. Decreases in connectivity in the default mode network (in green) correlates with decreased mind wandering in meditators. Increased activation of regions in red is thought to relate to enhanced attention and regulation of arousal and emotion. Decreased activation of the amygdala (in blue) likely reflects emotional regulation. Finally, increased cortical thickness found in the insula (in purple) may be responsible for enhanced interoception and sensory awareness. ACC, anterior cingulate cortex; PCC, posterior cingulate cortex; PFC, prefrontal cortex. Figure created with BioRender.com.

Wit v. United Behavioral Health), insurance companies may actively avoid offering prospective, recovery-oriented health care. After acute stabilization, without access to appropriate resources, patients may get stuck in a "default mode" of suffering. The solution is to move toward a system that pays for what works in the long term instead of what saves money for insurance companies in the short term.

Faced with the suffering of the world, the Buddha concluded that mindfulness offered an alternative to our instinctive tendency toward ruminative mind wandering. It provided the balance, comprehension, and clarity to help individuals navigate the inherent challenges of life. Two thousand years later, we are still faced with the harsh reality of suffering and impermanence in the world. We are mired in a mental health crisis that current approaches are not adequately addressing. Perhaps it is time to look outside the walls of our luxurious palace and expand our perspectives beyond the conventional boundaries of "modern medicine."

Acknowledgments and Disclosures

Clinical Commentaries are produced in collaboration with the National Neuroscience Curriculum Initiative (NNCI). David A. Ross, in his dual roles as Executive Director of the NNCI and as Education Editor of *Biological Psychiatry*, manages the development of these commentaries but plays no role in the decision to publish each commentary. The NNCI is funded in part by the Deeda Blair Research Initiative Fund for Disorders of the Brain through support to the Foundation for the National Institutes of Health.

DAR is supported by the Alberta Health Services Chair in Mental Health Research. AMN is supported by National Institute on Aging Grant No. U54AG062319 as well as funding from the Center for Women's Health Research at the University of Colorado. ASA is supported by the Yale Department of Psychiatry's Neuroscience Research Training Program's T32 Fellowship.

ASA is a co-founder of Mefreely, LLC, a company building an integrative mental wellness platform. All other authors report no biomedical financial interests or potential conflicts of interest.

Article Information

From the Department of Psychiatry (ASA, DAR), Yale University School of Medicine, New Haven, Connecticut; Department of Psychiatry (HWC), Icahn School of Medicine at Mount Sinai–Elmhurst Hospital Center, New York, New York; Department of Psychiatry (AMN), University of Colorado Anschutz Medical Campus, Aurora, Colorado; and the Department of Psychiatry (DAR), University of Alberta Faculty of Medicine and Dentistry, Edmonton, Alberta, Canada.

ASA and HWC contributed equally to this work.

Address correspondence to AZA Stephen Allsop, M.D., Ph.D., at aza.allsop@yale.edu.

Received May 2, 2022; revised May 6, 2022; accepted May 10, 2022.

References

1. Lazar S (2020): How meditation changes the structure of the brain. Available at: https://www.massgeneral.org/charged/episodes/sara-lazar. Accessed November 18, 2021.
2. Afonso RF, Kraft I, Aratanha MA, Kozasa EH (2020): Neural correlates of meditation: A review of structural and functional MRI studies. Front Biosci (Schol Ed) 12:92–115.
3. Raichle ME, MacLeod AM, Snyder AZ, Powers WJ, Gusnard DA, Shulman GL (2001): A default mode of brain function. Proc Natl Acad Sci U S A 98:676–682.
4. Brewer JA, Worhunsky PD, Gray JR, Tang Y-Y, Weber J, Kober H (2011): Meditation experience is associated with differences in default mode network activity and connectivity. Proc Natl Acad Sci U S A 108:20254–20259.
5. Kabat-Zinn J (2011): Some reflections on the origins of MBSR, skillful means, and the trouble with maps. Contemporary Buddhism 12:281–306.
6. Shapero BG, Greenberg J, Pedrelli P, de Jong M, Desbordes G (2018): Mindfulness-based interventions in psychiatry. Focus (Am Psychiatr Publ) 16:32–39.
7. Janes AC, Datko M, Roy A, Barton B, Druker S, Neal C, *et al.* (2019): Quitting starts in the brain: A randomized controlled trial of app-based mindfulness shows decreases in neural responses to smoking cues that predict reductions in smoking. Neuropsychopharmacology 44:1631–1638.
8. Roy A, Hoge EA, Abrante P, Druker S, Liu T, Brewer JA (2021): Clinical efficacy and psychological mechanisms of an app-based digital therapeutic for generalized anxiety disorder: Randomized controlled trial. J Med Internet Res 23:e26987.
9. Miller CWT, Ross DA, Novick AM (2020): "Not dead yet!" – Confronting the legacy of dualism in modern psychiatry. Biol Psychiatry 87:e15–e17.
10. Insel T (2022): Healing: Our Path from Mental Illness to Mental Health. New York: Penguin.