What Mindfulness Does to Your Brain: The Science of Neuroplasticity

Practicing mindfulness consistently can change the way you think, feel, and act—because it can literally change your brain. Here's the science to prove it.

By Maggie Seaver
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Your brain is plastic (no, not like that). The mind’s many intricate networks of neural pathways are continually and automatically adjusting through a phenomenon called neuroplasticity (neuro-, meaning relating to nerves or the nervous system; and plastic, meaning easily shaped or molded).

“Neuroplasticity is the capacity of the brain to reorganize its connections based on experience,” says Amishi Jha, PhD, an associate professor in the department of psychology at the University of Miami and the director of contemplative neuroscience for the UMindfulness initiative. “It’s very much related to something
exciting we learned about just a couple of decades ago called neurogenesis, which means that even the adult brain can grow new neurons.”

The brain’s brilliant malleability allows us to acquire new skills, drop bad habits, adapt to novel environments, and even heal from severe trauma and injury. Neuroplasticity is catalyzed by these events, too. Every new experience or challenge, from breaking an ankle to shopping at an unfamiliar grocery store, compels the brain to rearrange its synaptic connections. And the more you do something, the more established—and less new—these connections become. Repetition is the key to rendering a behavior second nature. (That’s how you learned to ride a bike. Now, riding a bike is like, well, riding a bike.)

We have more control over our thoughts and behaviors than we think. While the brain does adapt on its own, we know there are ways to take matters into our own hands: to awaken, strengthen, create, and even rewire certain neural pathways intentionally in order to boost brain function and overall health.

Even simple swaps to everyday tasks and behaviors can keep your brain on its toes by forcing it to fire up fresh connections. Use your non-dominant hand for manual tasks. Learn to play a musical instrument. Take a new route to the pharmacy. Play memory games. Try reacting to an email with patience instead of exasperation. Practice mindfulness.

**Research finds mindfulness can physically change brain structures**

Mindfulness—an intentional state of focused, nonjudgmental awareness of the present moment—doesn’t just foster a pleasant moment of calm. Scientists find it can be a powerful tool for altering and strengthening key brain networks for the better. Mindfulness techniques have been proven to promote positive change in the brain pathways involved in stress, focus and attention, memory, and mood. Some research has even found that a steady dose of mindfulness over a certain amount of time can physically change brain structures long term, including age-related brain degeneration.
In a seminal study from 2011, Harvard-affiliated researchers at Massachusetts General Hospital studied the brain MRIs of participants before and after they underwent an eight-week Mindfulness-Based Stress Reduction (MBSR) program. They also compared their brains to a control group who didn’t go through mindfulness training. Researchers observed that, after engaging in mindfulness training, their brains indicated visible structural changes when compared to the controls. For instance, they noticed increased gray matter density in the hippocampus, a structure associated with storing memories and emotion control (which we do want more of). They also discerned decreased gray matter in the amygdala, a structure associated with stress, fear, and anxiety, including our fight-or-flight response (which most of us need less of). What’s more, the less stressed out the subjects reported being, the smaller their amygdalas appeared to be.

This finding hinted that mindfulness techniques could reduce stress, not by eliminating the external stressors of everyday life, but by tempering the influence of the brain region responsible for our often out-of-proportion reactions to them. (You can watch the fascinating TEDx here, where senior study author, Sara Lazar, PhD, an associate researcher in psychiatry at MGH and assistant professor in psychology at Harvard Medical School, breaks down findings further.)

Almost a decade later, Jha studies attention and memory systems in the brain, finding ways to optimize mindfulness-based techniques to boost focus, improve emotion management, and build resilience in high-pressure groups, like military service members, elite athletes, and first responders. Through her years of research, Jha has indeed found that mindfulness training can actually train the brain to optimize—to be even better than its typical healthy functioning.

“There's something called cortical thickening, which means certain regions of the brain look healthier, because the thicker the brain, the healthier that tissue is,” Jha says. Think of the brain like sheets of cells—kind of like a stack of papers—that have been crumpled up as tightly as possible. The more tightly “crumpled” the sheets of brain cells (or the more gyrification, or folds, in the cerebral cortex), the healthier the brain.

As we age and experience stress, the cortex naturally thins out and loosens. This deterioration of the cortex helps explain why, for example, people forget their keys...
more often and find it harder to pick up new skills (among other frustrating changes) as they get older. But mindfulness training can actually help prevent the typical cortical thinning that comes with age.

“We know that when people are long-term mindfulness practitioners, they don’t show normal declines as a function of aging,” Jha says. “They don’t have as much de-gyrification [and] the brain looks healthier and younger.”

**Mindfulness strengthens key brain networks linked to focus, memory, and mood**

Just as you can deliberately lift weights to build strength and dexterity in a specific muscle over time, you can also exercise certain brain networks associated with core cognitive functions (like attention, logic, and memory) and emotion regulation (like quelling anxiety or negative reactions).

Some of the primary brain systems to benefit from mindfulness are those involved in our ability to focus and to regain focus when we get off track. One way we can fortify this crucial cognitive network is by applying a standard mindful breathing exercise that involves sitting quietly, breathing naturally, and focusing awareness on the breath for just a few minutes. Don’t analyze, worry about, or force the breath. Instead, be an objective observer of the action of breathing. Any time your attention wanders beyond the simple act of breathing, take notice of it. Then, redirect your attention back to the breath.

(You can give this, and other mindfulness-based breathing techniques, a try right now.)

Jha likens this deliberate mental training to a pushup. Each time you force yourself to focus on the breath, notice when your focus strays from it, and actively redirect focus back to the breath—that’s one pushup. The more mindfulness “pushups” you do, the stronger your ability to control your attention and maintain concentration—not just during a mindfulness session, but throughout your entire day.

"It’s like doing a core workout for your body," Jha explains. "If you’ve got core strength it will help you in a variety of ways—you’re going to be able to maneuver
through many different physically strenuous circumstances. Those brain routes become more accustomed to turning on and will start to fire instinctively the more you practice."

These basic mindfulness pushups can also help suppress the default mode network, a brain network associated with mind wandering, self-centered cravings, and other off-task distractions. Mind wandering is completely natural and beneficial; it promotes creativity and problem solving. But when you're trying to accomplish a cognitively demanding task (like paying attention in a meeting or making a rational decision), mind wandering can be a serious hindrance. When the default mode network is hyperactive you're more likely to cave to things like sugar cravings, anxious thought loops, or procrastination. As with all things, the default mode network requires balance and moderation.

“The very exciting news is we can now see that those brain networks [associated with focusing, noticing, and redirecting] look different in people who undergo four-to-eight-week mindfulness training programs,” Jha says. In these individuals, the focusing and noticing routes look more robust, while the mind-wandering, default mode network appears less active.

**Better cognitive control can help regulate emotions and mood, too**

“What allows people to have better emotion regulation? It comes down to better attentional control,” Jha says. Our emotions can lead the charge in a detrimental way. Distressing thoughts keep us awake at night. Anger colors our reactions. Fear of failure keeps us from achieving goals. At best, it's inconvenient; at worst, it contributes to debilitating mood disorders. Someone with consistent mindfulness experience, however, is equipped with powerful mental tools: the ability to step back and identify those emotional inhibitors and negative thought patterns, as well as the ability to actively steer away from them. They've developed the ability to reclaim power from problematic emotions.

“Typically we don't even know our mind has a mind of its own—we don't realize [we're] obsessing over a very distressing thought and feel stuck,” she explains. “But
now, with mindfulness training, you've got options: You can allow the thought to happen and then bring your attention back.”

This mindfulness method of decentering allows you to create mental space between yourself and your thoughts and emotions. “Think of it as being at a psychological distance from your own thoughts so you can watch what’s happening,” Jha explains. “Attention can’t be in two places at once: You can’t be watching a distressing thought and be in the distressing thought at the same time. So in addition to focusing, noticing, and redirecting, the capacity to psychologically distance yourself—to watch your thoughts, to be a good detective—really helps control things.”

Build mental fitness for life

Over time, and thanks to neuroplasticity, consistent mindfulness practice can actually make the frustrating mental challenge of recognizing, distancing, and steering thoughts one of your brain’s core capacities.

“This matters for everybody. These processes—attention, working memory, control over mind wandering—are central to really every single thing we do: making plans, reading, having a conversation, thinking, making decisions,” Jha says. “We need this kind of cognitive control to regulate our emotions, our mood, and our ability to interact with other people.”

Four to eight weeks of rigorous, lab-guided training isn’t in the cards for most of us. Jha’s team looks for ways to optimize mindfulness benefits and minimize the time commitment. And even after reducing meditation time in their research to only two hours a week for four weeks, plus short at-home sessions, they’ve found exciting benefits in participants: notable improvements in attention, working memory, and resilience, as well as reductions in everyday cognitive slip-ups (think: forgetting your coffee on top of the car). So imagine the small-but-mighty rewards we could all reap from, say, five to 10 minutes of mindfulness every day.

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