

YOUR BRAIN ON MEDITATION

The benefits may be beyond what we ever imagined—see what scientists are saying about how this simple act may mold your mind. BY DEBORAH SKOLNIK

You love how you feel after meditation. But have you ever wondered what it does to you—specifically to your brain? It's a hot area of research, and thanks to devices like magnetic resonance imaging (MRI) machines, scientists are now able to track what goes on in your head and what effect meditation may have on your mind.

While research is still in the preliminary stages (brains are a tough nut to crack), the findings are eye-opening: In addition to calming your heart rate and relaxing your muscles, meditation appears to affect the brain in very real ways—ones that can last far beyond your time on the cushion. It may be useful in boosting concentration and attention, and offer new help for people combating addiction and depression. It may even alter the structure of the brain itself, making desirable areas, such as ones that control memory, more dense, while shrinking parts that control negative emotions.

"I see this area of focus continuing to move in a positive direction as we begin to get real, meaningful results from our studies, and as many people move their health-care focus to preventative medicine and away from a purely pharmacological approach," says Robert Kaufman, a lab manager and

*all
in your
head*

MRI SCANS AND EEGS HELP RESEARCHERS SEE WHAT AREAS OF THE BRAIN ARE ACTIVATED (AND WHAT THE BRAIN WAVES LOOK LIKE) BEFORE, DURING AND AFTER A MEDITATION OR MINDFULNESS SESSION.

clinical research coordinator at the Lazar Laboratory in Boston, which is affiliated with Massachusetts General Hospital. Might you eventually get a script from your doctor to meditate as treatment for your anxiety or high blood pressure? "The research is not quite to that level yet, but we already see some clinical psychologists using meditation as a part of treatment for their patients suffering from things like anxiety and depression," Kaufman says. (For more on that, turn to page 20.)

As studies ramp up around the world, we asked some leading meditation researchers, here and abroad, to share the details of their work. Read on to learn how they conduct their investigations, as well as some of the exciting findings in this field.

HOW THE MAGIC HAPPENS

Researchers use many different techniques to study meditation, from simple questionnaires and skin tests to blood work, MRIs and EEGs (electroencephalograms). "The exact measures we take depend on the aim of the study," says Britta Hölzel, PhD, a neuroscientist with the Technical University of Munich.

Study participants are usually introduced

"ZEN DOES NOT CONFUSE SPIRITUALITY WITH THINKING ABOUT GOD WHILE ONE IS PEELING POTATOES. ZEN SPIRITUALITY IS JUST TO PEEL THE POTATOES."

ALAN WATTS,
PHILOSOPHER



Mindfulness elicits lower frequency theta and alpha brain waves.

to meditation through a class. “One that’s often used for research studies is an eight-week Mindfulness-Based Stress Reduction (MBSR) course that consists of once-weekly group meetings as well as a daily homework practice,” says Hölzel. “The MBSR course is used because it is a manualized, standardized training.” It’s set, and easy to reproduce.

“I would say the real magic of what we do comes in the form of MRIs,” says Kaufman. “They give us a ton of information and are very meaningful—they give weight to the argument that meditation can actually change the shape of the brain.” MRI studies tend to focus on multiple areas of the brain. These include the prefrontal cortex (“sort of the focused-attention area,” Kaufman says); the hippocampus, which is thought of as the memory area; the amygdala, a region responsible for a lot of emotional stimuli and strong negative stimuli, like fear responses; and the insula, a deep-brain area that is related to the functioning of the default mode network, or DMN. The DMN is a network of regions that are active when the brain is not focused on a task, such as when you’re daydreaming. When you begin to

focus on something, that activity is reduced. Essentially it’s the network that controls self-referential thoughts and mind wandering. “This is sort of what we’re looking at when we’re researching meditation,” says Kaufman. “Can we keep our minds from wandering and focus for a certain amount of time?”

WHAT WE’VE LEARNED

“Although the field is still in its infancy, several research groups have reported changes in brain regions following mindfulness meditation practice,” says Hölzel. Following are some of the most notable changes observed:

Greater Gray Matter One study from UCLA discovered that devoted, long-term meditators (those who’d meditated for 20 years, on average) have better-preserved brains than non-meditators as they age. Their volume of gray matter (which processes information) throughout the brain was denser. And though they still lost some volume as they aged, they lost less overall than people who didn’t practice meditation.

“Something that we’re continually working toward is proving the hypothesis that the gray

matter in the hippocampus [the memory area] will get more dense [with meditation],” Kaufman adds. In very general terms, the implication of that would be better memory or preserved memory, he says. (The Lazar Laboratory team found that eight weeks of MBSR increases cortical thickness in the hippocampus, a brain area that regulates learning and memory. At the same time, subjects showed decreases in the brain cell volume of their amygdalas.)

Weakened Wanderings Even something as simple as mindfulness meditation—where you return your attention to your breath whenever your mind wanders—can have profound effects on the brain. A study conducted at Yale found this type of practice quiets activity within the DMN. That’s a good thing, since mind wandering is linked to ruminating, worrying and being less happy.

Improved Attention and Concentration One study found that just a few weeks of meditation training helped people focus and recall facts during the verbal reasoning section of the GRE, the test required to get into many graduate schools. Subjects experienced a boost in their average overall score (from 460 to 520) and reported fewer distracting thoughts during the test.

More Ammo Against Addiction Since meditation seems to affect the brain’s self-control areas, it may also help people recover from different kinds of addiction. One study found that mindfulness training was more effective than the Freedom From Smoking Plan promoted by the American Lung Association. Subjects were more likely to have quit smoking by the end of training, and to continue abstaining at the 17-week follow-up point.

A Less-Activated Amygdala Researcher Gaëlle Desbordes, PhD, an instructor in radiology at Harvard Medical School and a neuroscientist at Massachusetts General Hospital’s Martinos Center for Biomedical Imaging, has been studying meditation’s effects on the brains of clinically depressed patients using functional MRIs. Her research has shown that after eight weeks of training in mindful attention meditation, their amygdalas are less activated. (She’s also found that changes in brain activity in subjects who’ve learned meditation hold

HOW SOUND IS MEDITATION RESEARCH?

Studies into meditation’s benefits utilize cutting-edge technology, yet there’s some blowback that the research itself may be flawed. Here’s why there’s debate:

POORLY FUNDED AND DESIGNED STUDIES “Financial resources for the research are usually very limited, so many studies use small sample sizes, poor control groups or inappropriate designs. It is therefore important not to overstate the findings,” says Britta Hölzel of the Technical University of Munich. Most of the results are preliminary, and despite some promising evidence, we don’t know exactly what meditation does for us yet.

THE EVER-INCREASING COMMERCIALIZATION OF SCIENCE Meditation researchers may have difficulty publishing a study that doesn’t have interesting results (for example, a study finds that meditation doesn’t help with impulsiveness). “To avoid shelving their research, scientists try to pull something, anything, out of their data in order to publish,” says Joshua Grant, PhD, a researcher at the Max Planck Institute in Germany. “In the worst cases, they cheat statistically in order to publish.”

HIGHLY BIASED RESEARCHERS “The people who are studying meditation tend to be those who believe in the benefits,” Grant points out. “They likely meditate themselves. So they have something to prove, to themselves and to others,” which can influence results.

Despite these obstacles, there’s plenty of room for optimism going forward as data show promising results and the momentum builds, says Robert Kaufman of Boston’s Lazar Lab: “We’re making each new study slightly stronger than the last.”

steady even when they’re not in meditating.)

“The brain changes with many things that we do,” says Hölzel. “But it is fascinating that it has this enormous capacity for adaptation and that in part, we can choose where we’d like to take these processes. The skills, attitudes and capacities that we choose to cultivate shape who we are—down to the level of our brain.”

New York-based writer/editor Deborah Skolnik frequently covers health issues.

a gray area

A BIGGER BRAIN ISN’T NECESSARILY BETTER, SAYS LAZAR LAB MANAGER ROBERT KAUFMAN. YOU MAY WANT MORE GRAY MATTER IN MEMORY AREAS, BUT NOT IN THOSE REGIONS ASSOCIATED WITH FEAR OR OTHER NEGATIVE EMOTIONS.