Scientific evidence from well-designed studies shows that meditation can increase attention span, sharpen focus, improve memory, and dull the perception of pain.

BY AMY PATUREL, M.S., M.P.H.

Meditation

In the spring of 2000, Cassandra Metzger was working as an attorney at the PBS headquarters in Washington, D.C., attending night classes for a master's degree at Johns Hopkins University, and training for her first 10K race. At 34 years of age, her life was full and fast. But during that spring and into the summer, she became unable to get out of bed because of unexplained pain and fatigue. By the fall, she had to stop working.

A year later, Metzger was diagnosed with fibromyalgia, a disorder of the central nervous system that seems to distort the body's normal response to pain. Some researchers believe fibromyalgia causes pain signals to misfire.

Metzger was prescribed painkillers, muscle relaxers, sleep drugs, mood stabilizers, and other medications to manage her pain, insomnia, fatigue, and resulting depression. None of these worked very well. Then she discovered meditation, an ancient practice of focused attention designed to silence the brain's default thought patterns and increase awareness of the present moment.

"Meditation saved me from despair more than once," Metzger says. "During episodes of acute illness, I was saved by knowing that the experience of pain was just one moment in time—maybe an excruciating moment, maybe a long moment, but still a moment. I learned this by meditating. The concept of impermanence—that everything passes away—may seem scary, but for someone who is vomiting from a pain medication on which she pinned every last hope, impermanence is a beacon." (See box, "Meditation: The Basics.")

NOW AND ZEN

Metzger's experience isn't unique. Millions of people all over the world claim that meditation transformed their lives. But for centuries, only anecdotal reports about these benefits were available as proof. Now, scientific evidence from well-designed studies—including images of the brain—is emerging. Some of these studies suggest that meditating for as little as 20 minutes daily can affect the function and structure of the brain in a positive way. Researchers have found that meditation increases attention span, sharpens focus, improves memory, and dulls the perception of pain.

"Physical changes in brain structure convince most skeptics that the benefits of meditation go beyond the placebo effect," says neurologist Alexander Mauskop, M.D., director of the New York Headache Center, associate professor of neurology at the State University of New York Downstate Medical Center, Fellow of the American Academy of Neurology, and author of "Nonmedication, Alternative, and Complementary Treatments for Migraine," upcoming in the AAN's journal *Continuum*. The placebo effect is the benefit that a person derives from his or her positive expectations of a treatment rather than from the treatment itself.

During the past 20 years, scientists have shown great interest in studying how and why meditation works. In 1998, a search of the medical literature using the key words "mindfulness meditation" would bring up only 11 scientific studies, compared to more than 560 today, according to David Vago, Ph.D., instructor at Harvard Medical School and associate psychologist at Brigham and Women's Hospital in Boston, MA.

YOUR BRAIN ON MEDITATION

This surge in research is a byproduct of neurologists' discovery that meditation produces measurable changes in the brain, say experts. For example, in a 2011 study published in the medical journal *Psychiatry Research: Neuroimaging*, researchers found that people who participated in an eight-week mindfulness meditation program experienced increased density in brain regions associated with memory, one's sense of self, em-

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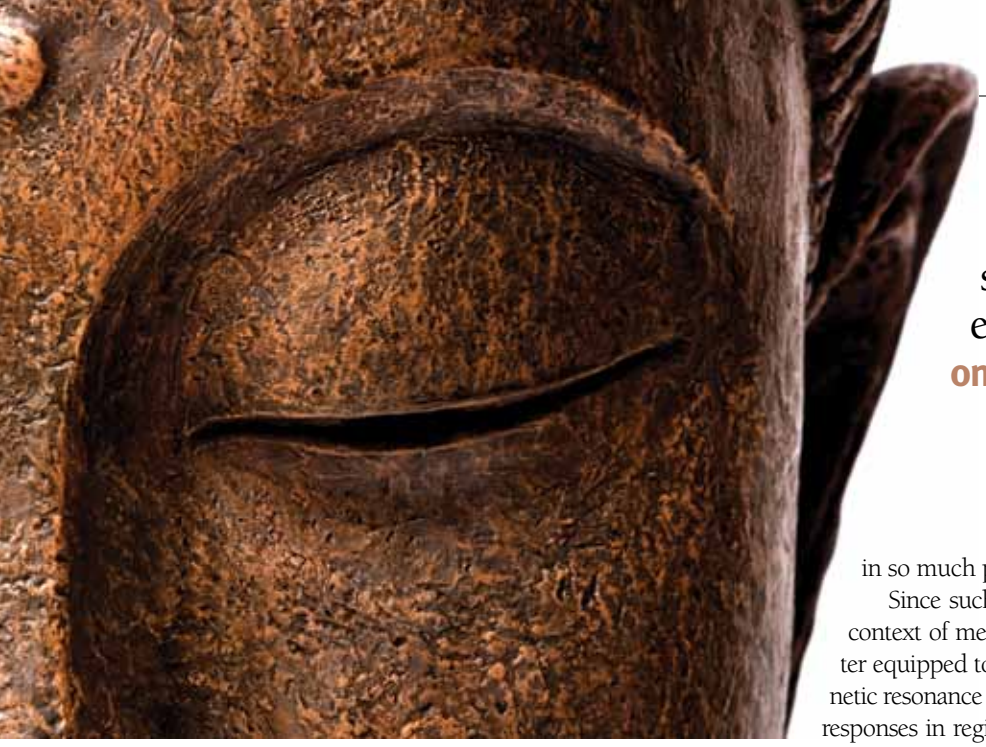

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pathy, and stress response.

Previous studies uncovered a thickening of both gray matter (the parts of the brain involved with thoughts and emotions) and white matter (the parts of the brain that connect different gray matter regions) among meditators compared to people who don't meditate regularly. While scientists aren't clear what these changes mean, they suspect that thickening gray and white matter is associated with the ability to process information more efficiently.

Meditation may even buffer the aging brain. "When researchers compared the brains of normal aging adults and same-age serious meditators, they found that the brains of the meditators did not shrink. What we accept as a normal process—the shrinking of the brain as you get older—may not be necessarily normal," says Dr. Mauskop.

More recently, meditation researchers have investigated how meditation impacts what they call the brain's default mode network (DMN), which includes the self-talk that constantly chatters in the background as you go about your day. According to Katherine MacLean, Ph.D., a researcher in the psychiatry and behavioral sciences department at Johns Hopkins School of Medicine in Baltimore, MD, the brain regions involved in the DMN include the medial prefrontal cortex (front middle part of the brain) and the posterior cingulate cortex (back middle part of the brain).

For most of us, the DMN tends to focus on the past or the future instead of the present moment. For example, we may be vaguely aware of thoughts looping through our consciousness, such as "Why did I just say something so stupid?" or "I have so much work to do this week" or "I can't remember when I wasn't in so much pain, and it will probably never stop."

Since such self-talk is a well-known distraction in the context of meditation, successful meditators might be better equipped to control the DMN. A recent functional magnetic resonance imaging (fMRI) study revealed shorter neural responses in regions of the DMN of meditators compared to non-meditators, suggesting that meditating on a regular basis enhances the ability to limit negative self-talk such as dwelling on past mistakes or imagining problems in the future, allowing instead for meditators to stay in the now.

Researchers suspect that less DMN activity enables the brain to rest and remap itself. "Shutting your brain off for portions of the day—for example, through meditation—may be a very healthy activity for your brain over the long term," says Dr. Mauskop.

PAIN AND THE MEDITATING BRAIN

People with a chronic, painful illness such as fibromyalgia may feel alienated from or betrayed by their own bodies. They may also feel estranged from family and friends as a result of their illness. In Metzger's case, meditation helped her stay in touch with her body and her loved ones.

"I learned to continue to inhabit my body rather than try to flee from it," she says. "And meditation helped my relationships in terms of accepting what is and letting go of my expectations of other people." Metzger even had experiences where her pain vanished during a meditation session. "It didn't happen all the time, but the fact that it happened at all was astonishing to me, especially after nine months of unsuccessfully trying to relieve my pain with drugs," she adds.

Several studies confirm that people who meditate regularly experience less pain than those who don't meditate. Fadel Zeidan, Ph.D., a researcher at Wake Forest School of Medicine in Winston-Salem, NC, reported in a study in the *Journal of Neuroscience* in 2011 that newbie meditators showed a 40-percent reduction in pain intensity and a 57-percent reduction in pain unpleasantness after just a few short sessions of mindfulness meditation training. Although the researchers didn't directly test for this, meditation produced a greater pain reduction than morphine, which typically reduces pain by about 25 percent.

In another study, Dr. Zeidan and his colleagues found that 20-minute meditation sessions for just three days helped a small group of volunteers significantly reduce their sensitivity

INNOVATIVE THERAPIES

This is the seventh in a series of regular articles covering complementary therapies. Also known as alternative therapies, they are now being tested by researchers to augment standard medical treatments.

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to mild electric shocks—even when they weren't meditating at the moment of shock. "Mindfulness meditation alters the way people experience pain," says Dr. Zeidan. "It teaches you to look at each moment and with appreciation, even when that moment includes pain."

Researchers say that meditators still sense discomfort, but they have discovered how to effectively manage their emotional response to pain. Indeed, meditators who experience distress while in a meditative state show greater activity in areas related to body awareness, such as the anterior insula and somatosensory cortex.

"They're actually more in tune with the sensation of pain, but they don't have their usual emotional reaction to it," explains Dr. MacLean.

Instead, meditators learn to recognize emotions such as pain, fear, or anger, without giving into the pessimistic thoughts or chain of behaviors that habitually follow. Non-meditators, on the other hand, tend to get stuck focusing on the negative emotions, as Dr. Vago has found in his research. People with fibromyalgia, for example, have a tendency to dwell on thoughts about pain because they experience chronic pain, usually every day. "When they see a word like 'throbbing' or 'pounding' show up on a computer screen, they detect it quickly and avoid it," says Dr. Vago of his research.

"If the word is on the screen long enough to process it on a conscious level, they begin to ruminate," he adds. On the plus side, Dr. Vago's team found that after eight weeks of meditation, those tendencies were gone.

"When you're dealing with acute pain, thinking about how horrible the future will be can be even more powerful than the pain itself," says Dr. Vago. "The pain network turns on in anticipation of discomfort, and only when the pain comes does it finally turn off. Actually experiencing the pain can almost feel like a release."

Rather than engaging the fight-or-flight response of the sympathetic nervous system in anticipation of pain and trying to escape it, meditators learn to accept the sensation of pain. Once they do, pain no longer grips their minds. It becomes another experience that comes and goes.

"Even if the discomfort doesn't go away completely, meditation opens a gap between pain and me," says Metzger. "Instead of the pain acting like a vise that grips my spinal cord, it will kind of float in my body. And often, that's enough of a relief."

MEDITATING MECHANICS

The great thing about meditation is anyone can do it, anywhere. It doesn't require special equipment, a gym membership, or an advanced degree. Practitioners simply focus on a sound, object, mantra, or their breath. The point is just to shut everything else out.

"Meditation is the simplest technique in the world," says Dr. Mauskop, "but that doesn't mean it's easy to do." In fact, staying with a painful sensation or experience can be mind-numbingly difficult (pun intended). Fortunately, you don't need the dis-

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Meditation: The Basics

Meditation has aptly been described as "thinking about not thinking," ideally for 20 minutes or more every day. During this uninterrupted time, you calmly become aware of your thoughts and distance yourself from those thoughts. It's normal for your mind to wander. When that happens, as it inevitably will, gently detach from the distracting thoughts and bring your attention back to your breathing, a word, prayer, or an object.

Meditation is not completely risk-free. It can unearth fear, trauma, or painful memories for some people, particularly those who have psychotic disorders, severe depression, or post-traumatic stress disorder. "These individuals should only meditate under the supervision of a mental health provider or experienced meditation teacher," says Katherine MacLean, Ph.D., of the Johns Hopkins School of Medicine.

While there are many different types of meditation, here are a few of the most common:

- **ATTENTION MEDITATION:** Sit on a cushion or chair with your back straight and your hands in your lap. Then concentrate your mind on a focal point, such as your breath, an internal image, or a burning candle. If your mind starts to wander, gently bring your attention back to the focus of meditation. Over time, this practice will train the mind to watch out for distractions, "let go" of them once they arise, and refocus when necessary.
- **MINDFULNESS MEDITATION:** The aim in this form of meditation, which has origins in Buddhism, is to monitor various experiences of your mind—thoughts, feelings, perceptions, and sensations—and simply observe them as they arise and pass rather than trying to interact with them or change them. The idea is to maintain a detached awareness, without judgment, to become more aware and in touch with your body, your life, and your surroundings.
- **PASSAGE MEDITATION:** Passage meditation involves reciting a short passage (prayer, mantra, or short poem) silently to yourself over and over and over again. The meaning of the words is not the most important element—most importantly, the words are a focal point for attention. "Passage meditation is great for beginners since it's hard to maintain distracting thoughts when you have a verbal anchor," says Dr. MacLean.
- **BENEVOLENT MEDITATION:** Benevolent meditation generates beneficial states of mind for yourself and others. A common approach is to repeat: "May I be happy. May I be free of suffering. May I be healthy. May I live with ease." Then repeat the same passage focusing your attention on someone you love, then on a stranger, then on an enemy, and then on all creatures. "People with chronic illnesses often experience a lot of self-loathing and self-blame," says David Vago, Ph.D., of Harvard Medical School and Brigham and Women's Hospital. "If you can transform those negative emotions toward yourself into compassion and love, it not only benefits you, it also benefits everyone around you."

cipline of a Tibetan monk to experience the benefits. The key, Dr. Mauskop says, is to approach the practice of meditation with curiosity and without judgment, accepting what is true in that moment—including the fact that meditation can be difficult. Instead of trying to change your experience—"Why can't I meditate better and not feel in pain?"—you simply become aware of your desire to change it.

According to Metzger, each day is different, and you can't always replicate a positive experience. "There are times when I'm in such agony that I can't meditate on my own," she says. "During those times, I don't worry about sitting in a particular position. I just lie on my bed and put on a CD with a guided meditation—one specifically about pain—and that usually helps." (See Resource Central, page 49, for books and CDs on meditation.)

The goal, say experts, is to focus your attention. "You don't even have to be in a sitting position to meditate," says Dr. Vago. "You can be standing in the grocery line. If you're getting frustrated, just move your awareness to your breath. It's that simple." He also suggests taking three breaths in a sitting position before getting out of bed. "It's amazing how something that subtle can change the experience through your day."

While research hasn't yet pinpointed how much time is required to achieve benefits, experts say practicing even 5 to 10 minutes daily can help. The novices in Dr. Zeidan's studies reported less pain with 20-minute practices. In a second experiment, he found that similarly brief sessions improve cognitive performance on tasks that demand continuous attention.

"It's hard to imagine the structure of the brain could shift after a little more than an hour of meditation training over three days," says Dr. MacLean. "But on a psychological level, simply being able to take a different perspective on pain has all sorts of immediate benefits."

Perspective can have powerful effects. Viewing illness as a battle to be won, for example, may set some people up for failure, particularly when a chronic illness has such a strong presence that it can't be defeated.

"I learned in meditation to breath in the physical sensation of pain and accept it in the most profound way, which depleted some of its power and hold. Without the practice of meditation I never could have done that. It never would have even occurred to me to try."

After 12 years, meditating can still be challenging and counterintuitive for Metzger. "I have learned not to fight my experience, but to accept it and breathe into my pain," she says. "During long hauls of illness—weeks of being in bed, alone, isolated, falling into despair—meditation creates a space for hope to creep in." And that can make all the difference. NN