



## Natural-Born Pain Killers

### Neuroscientists are discovering amazing new ways your brain can outwit your pain

by Richard Laliberte

Over the course of several days in 2005, Laura Tibbitts, a 33-year-old director of operations for a San Francisco nonprofit, slid into the tubular confines of an MRI machine for extensive brain scans.

Her task: to increase and decrease her chronic pain by using her thoughts alone. Evidence of her success would be displayed on a monitor above her as the MRI trained its sights on an area deep in the brain that processes pain. Tibbitts desperately needed the cutting-edge therapy to work: Years before, she'd been thrown from a horse and severely fractured her upper arm and shoulder blade. Despite multiple surgeries that helped heal the breaks, the pain had never relented. Now, as a volunteer in a unique study at Stanford University School of Medicine's Pain Management Center, she was hoping to regain control.

As the MRI machine clunked and clicked, she first tried to make her pain worse. "I'd relive the injury," she says, "or imagine being stabbed in the back." By her own subjective measurement, her pain shot up to 9 on a scale of 10. Then she was asked to think in ways that might reduce her discomfort. Because she was lying down and couldn't move, she pictured little men, like Lilliputians in *Gulliver's Travels*, scooping pain out of her back and carting it away. Then she focused on her big toe--"someplace that didn't hurt"--to direct her mind toward neutral sensations. Or she repeated affirming phrases such as "This is going to get better" or "I'm going to be okay." To her great relief, she found that she could will her pain to plunge from a 9 to a 4--far below what it was when she started the mental exercises.

The investigators had expected to see benefits, but even they were astonished by what the MRIs revealed: Using mental strategies, Tibbitts and other patients were able to reduce their pain by nearly two-thirds, reports study leader Sean Mackey, MD, PhD, director of the Stanford Systems Neuroscience and Pain Lab. "It was really exciting to show for the first time that people could direct activity away from a specific region of the brain--in this case, the area that processes pain--and alter their perception of pain at will," he says. "It gave subjects a profound sense of empowerment and opened a window on pain in the brain that has huge implications."

Thanks to state-of-the-art imaging technology, neuroscientists are gaining a new understanding of how pain works--and of new ways to tame it. They now know that pain causes sparks of activity in multiple areas of your brain, not just in a centralized "pain center." "Pain is both a sensation and an emotion," says Francis Keefe, PhD, associate director for research at the Pain and Palliative Care Program at Duke University Medical Center. "That means what you're thinking and feeling can modify your pain and make it better--and that's great news because it substantially expands our armament for relieving suffering."

Among the most dramatic new findings about pain management:

You can intensify pain episodes by putting a negative spin on your pain--fearing it, dreading it, considering it the worst thing in your life.

Conversely, you can significantly reduce your pain by recognizing and blunting such noxious thinking.

You can actually shut down the signals that are responsible for pain by doing relaxation exercises such as meditation, guided imagery, and deep breathing. The relief you'll gain can enable you to reduce your use of pain medication; when combined with the exercises, the lower doses are particularly effective.

In the same way that Buddhist monks' meditative practices can physically rewire their brains, yours could develop on its own the capacity to resist pain. "We think the brain may be able to build ongoing pain tolerance," says Scott M. Fishman, MD, a professor and chief of the division of pain medicine at the University of California, Davis. "It's consistent with what the Budd-hists teach: We have enormous power to control the sensations that affect us."

But before you can start to exercise that control, you first need to identify the major mental pain magnifiers.

### Pain booster: You dread what's coming

Expectations about pain can be self-fulfilling: If you think it will be bad, it will be--and you might even feel worse than you should. When people in a Wake Forest University School of Medicine study were told they wouldn't feel much pain (in the form of nonharmful heat) but then were stimulated more severely than expected, they rated their discomfort 28% lower than they did when told it would hurt more. That's the palliative equivalent of getting a shot of morphine. "If you anticipate the worst, areas of the brain that process pain become more active even before you feel what causes it--and continue to be more active during the stimulus and after," says Keefe. "Your attitude affects how bad you'll feel." Fortunately, you can adjust it.

#### Brain Rx: Outsmart your fear

**Track your patterns** Keep a detailed pain diary for 2 weeks, suggests Keefe. "People think they understand their pain and usually have the impression that it's always bad," he says. By monitoring how your pain changes, you'll find that it often follows a predictable pattern; knowing what that pattern is will help you feel more in control and you'll have an idea when it will ease up. Note where you are when pain strikes, what you're doing, whom you're with, how you feel emotionally--and when the discomfort recedes. "Many of my patients come back from this exercise with substantial insights about what triggers their worst pain--and their dread of it," Keefe says. The benefits of close monitoring can have big, often immediate, payoffs: Keeping a pain diary on any given day consistently helped rheumatoid arthritis patients cut their pain intensity the next day by an average of 28%, according to a recent study at the University of Missouri-Kansas City School of Medicine.

**Study the phenomenon** Just understanding the biomechanics of pain lessens its power, says Keefe. For example, people with chronic lower-back problems who made the effort to learn how the nervous system handles pain had better attitudes about it and gained more mobility than those in a control group who were taught only about back anatomy, found Australian researchers. Read articles and books about pain, go to your local library and study diagrams of the human body, or go to [prevention.com/painrelief](http://prevention.com/painrelief) for more information on this topic.

### Pain booster: You dwell on your pain

The more attention you pay to pain, the more processing power your brain must devote to it, and the more you will hurt. Fortunately, even if you're an Einstein, your processing power is limited. Moreover, you can steal some of that energy from your pain. "The brain can handle only so many messages at once," says Robert Gatchel, PhD, a clinical professor of pain management at the University of Texas Southwestern Medical Center. "If you switch on one part of the brain, activity in another part decreases." By encouraging the brain to pay attention and give priority to other signals, you can create a neurological traffic jam that will stop pain in its tracks--or at least make it take a detour.

#### Brain Rx: Cultivate distraction

**Play a video game:** With their bright animation and mental challenges, electronic games are proven to provide the kind of diversion that can ease pain. Brain scramblers known as Stroop tests, which interfere with the reaction time of a task, decrease activity in pain-processing areas of the brain. One type of Stroop test, for example, might flash the word black on a screen in red letters, but instead of voicing the word, your task is to state the color--a simple but effective, and distracting, challenge. A series of Stroop tests can be found on Nintendo's handheld video game Brain Age.

**Enjoy music:** Even listening closely to music you don't choose (such as the Muzak piped into malls and restaurants) eases pain, depression, and disability, according to a 2006 study at the Cleveland Clinic Foundation. "Try to memorize lyrics of new songs, or just float with the sound," says Gatchel. Program an MP3 player with your favorite songs and play it whenever you feel pain coming on. If you play an instrument, learn a new tune.

**Use your imagination:** In your mind's eye, watch pain floating out of your body; visualize yourself in a room where a healer lays soothing hands on you; picture a fire extinguisher dousing the pain's fire. These are all mental images that make the brain reinterpret pain and diminish its power. To take your mind off pain altogether, picture a favorite place (a beach, a mountaintop) and try to recall as many sensory details as possible, including colors, sounds, and smells.

### Pain booster: You're a drama queen

Maybe I have cancer. This pain will never get better. When statements like these repeatedly run through your head, you're showing signs of catastrophizing--jumping to the worst conclusions. Beaten down by pain, you persuade yourself that it's a sign of terminal illness or that it's unstoppable. That, in turn, magnifies your discomfort and leads to greater disability. The nastiest of all pain boosters, catastrophizing has been shown in studies to trigger the greatest responses in areas of the brain linked to anticipation of and attention to pain. It even activates motor areas responsible for reactions such as grimacing.

### Brain Rx: Shift your perspective

**Refocus on right now:** When Jackie Gardner-Nix, MD, PhD, a chronic-pain consultant in the department of anesthesia at two teaching hospitals in Toronto, took a course on mindfulness meditation to ease her own stress, she quickly saw how its key component--focusing on the present moment--could help her patients. The results were even more dramatic than she expected. "After years of prescribing drugs for pain, I found this to be much more far-reaching," she says. "People who practice mindfulness meditation progress steadily toward wellness and improved quality of life--and if they use pain medication, it works better even as they take lower doses."

**Talk yourself down:** Phrases like "I can't go on" have power. But so do counteractive ones like "Take a time-out." When you find your worries escalating, pause and objectively analyze whether things are as bleak as you say. They usually aren't. "Say to yourself, This is tough, but I can manage or I've been through this before and I know the pain will get better," says Keefe. Write those affirmations down and repeat them like mantras when you're in the throes of a painful flare-up.

### Pain booster: You're stressed-out

Pain does a dance with stress: Any tormenting twinge spurs the brain to release stress hormones that heighten awareness, followed by endorphins that dampen pain. This response has roots deep in our evolutionary history: With its eons of experience, your brain assumes that if you're hurt, you may need to focus on something more important than pain, like outrunning a hungry bear (stress hormones give you this energy). When pain drags on, however, the analgesic effect (powered by endorphins) wears off, and the stress just makes you tense--which can cause muscle spasms that produce more pain. "Muscle tension takes a bigger toll than people realize, especially on the back and jaw," says Gatchel. Stress also makes everything feel more overwhelming and out of control, leaving you both more sensitive to pain and less able to cope with it.

### Brain Rx: Calm yourself

**Check tension regularly:** When you're caught up in a crazy day, you may not even notice you're tense--unless you make a conscious effort to stop and check. "I especially see this in women who focus so much on getting everything done for their families. They don't think they're stressed--they just think they're doing their job," says Gatchel. If necessary, place a visual cue someplace you'll see often--a dot sticker on your refrigerator or phone, for example--to remind you to stop and mentally review your body for tension. When you do, focus on different areas of your body one at a time, making each as relaxed as possible.

**Practice relaxation:** Basic calming techniques such as focusing on slow, steady breathing have been shown to be as powerful as analgesics. Fishman once discovered that focusing on his breathing doubled or tripled the length of time he could tolerate the pain of an ice cube that had been placed on his hand. "Just paying attention to breathing is close to meditation," says Fishman. "It's easy but can have profound effects on stress, anxiety, and pain." Try this: Inhale as deeply as you can with your mouth closed to a count of 6. (If it helps, place your hand on your stomach to feel it expand as your lungs fill.) Hold the air in your lungs for a count of 4 and then slowly exhale for a count of 6. Repeat the process three to five times.

Steps like these can reverse the mindset behind every pain booster: the sense that your body--your pain--controls you, says Gatchel. "Once you realize that you're in control, dealing with pain will be much easier."

### Real-Life Success: "It helps to control my thoughts"

Since college, Andrea Cooper, 51, of Phoenix, MD, has suffered from fibromyalgia, a chronic condition that produces intense, debilitating muscle pain and spasms:

"My pain starts as a dull ache in my shoulder, then creeps up my neck. If it reaches my head, it's like a siren goes off and my whole body just screams. Knowing this pattern, I try to intervene. I'm a graphic artist and took an interest in the diagrams at my doctor's office showing muscles and nerves. When I'm feeling pain, I try to visualize its physiology and tell myself, It's just that nerve being annoying. It helps to be able to label and identify the area where it all starts."

### Real-Life Success : "I've learned to relax tense muscles"

When feeling tense while teaching energetic prekindergartners, Harriet Velevis, 56, of Dallas, would clench her teeth, leading to temporomandibular joint (TMJ) disorder, a condition that causes chronic jaw and head pain:

"In the classroom, I keep a postcard that I bought on a wonderful trip to wine country. It shows old, gnarly vines with hills in the background and a beautiful, blue, sunny sky. When I sense I'm getting stressed and am about to clench my jaw, which leads to my pain, I look at the picture. It has such relaxing associations for me, and it helps me center myself and prevents me from tensing those facial muscles. It sounds simple, but it's been life altering."

### Real-Life Success : "Without meditation, I'd be a zombie"

Intense head pain that began 7 years ago was caused by a spine tumor, but even after Cheryl Simpson, 38, of Alliston, Ontario, had surgery to remove it, the pain mysteriously continued:

"I'd been taking high doses of medication for chronic head pain since 2000. It was the only way I could get out of bed and function. I took a mindfulness meditation class, which included a CD with a guided body scan that has you progressively focus on relaxing different areas, from your toes to your head. After the first 12 weeks, I didn't have to increase my meds, so something seemed to be working. After a second course, my pain averaged 5 out of 10, instead of 7 or 8. That's a tremendous difference. By the end, I was able to dramatically reduce my drug dosage, and now I feel good enough to try and go back to work after 7 years of pain."

### **The best place to fight pain**

If your regular doctor can't provide relief, ask for a referral to a pain management clinic (whose costs are covered by most insurance plans). There, you'll get:

**A better diagnosis:** Doctors will give you a complete physical exam and assess the severity of your pain. Prepare for your first appointment by keeping a pain diary for 2 weeks. Describe where you hurt, what you're doing when it comes on, how it feels (throbbing, shooting, or aching, for example), how intense it is, and when it changes--all of which help doctors determine the cause.

**Physician support:** Your pain management squad may include a neurologist (who can trace pain pathways through the nervous system), an anesthesiologist (who can interrupt those pathways with drugs or steroidal injections), a rheumatologist (to handle arthritis issues), a psychiatrist (to counsel on stress and mood), and a physiatrist (to design a comprehensive treatment).

**A full menu of alternative strategies:** Pain centers are leading practitioners of integrative medicine. Your treatment may also involve mental coping techniques such as imagery, relaxation, and stress management as well as acupuncture, chiropractic, and massage. To find a pain center, search by state at [pain.com](http://pain.com), an educational Web site for consumers and health care professionals.

*(Posted June 2007)*