

Buddhism's Pain Relief

by Rick Heller



Rick Heller reports on new developments in neuroscience that validate the Buddhist teachings on pain and suffering. It's further evidence of the many ways that mindfulness practice helps us deal effectively with pain.

While many religions value introspection, scientists often view it with skepticism. After all, if something is subjective and cannot be measured, how can you be sure it's true? The insights of the Buddha were produced by self-observation. Thus, until recently, they fell outside the realm of scientific verification. But with the development of brain imaging technology such as functional MRI, it is now possible to carry out introspection and scientific observation in parallel, and to assess how well self-observation stacks up with objective methods of inquiry.

Among the Buddha's first teachings after his awakening were the four noble truths. The first three, regarding the ubiquity of suffering, its origin, and its cessation, find strong support from neuroscience research. In particular, the Buddha's views on suffering associated with physical pain appear to be valid, and perhaps *more* advanced than those in the West—especially prior to the new scientific theories on pain that were introduced in the 1960s.

In the last fifty years, and especially in the last decade, brain scientists have explored the origin of suffering and discovered something strikingly similar to the parable of the two arrows, which the Buddha offered to convey a skillful way of encountering

physical pain. Physical pain, the Buddha taught, is like being shot with one arrow. The person who does not resist physical pain feels only that arrow. However, the average person who experiences pain also adds a layer of emotional suffering. Anguishing over pain is like being shot with a second arrow.

Although we commonly experience physical pain as a single phenomenon, it is actually composed of distinct elements that include the sensation itself and an aversive element we call suffering. Not only does aversion create suffering—the second arrow—it's increasingly clear that a person's attitude can affect the first arrow, the pain sensations themselves.

Ronald Siegel, a Buddhist practitioner and a psychologist on the clinical faculty of Harvard Medical School, says the practice of mindfulness can alleviate suffering and, in some cases, it can reduce the volume of physical pain sensations. Siegel is a specialist in the treatment of chronic back pain. Most cases of chronic back pain, he believes, are caused by muscular tension rather than structural problems in the body. Back pain and many other pain disorders stem from a feedback loop stirred by fear and negative thoughts that makes muscles tight.

“Once we experience a pain sensation that we are afraid is due to an injury, we bring all of our attention to it. And simply the bringing of fearful attention to pain increases the experience of pain,” Siegel says. “These disorders are maintained by fear of the disorder.”

In such cases, he believes that not only suffering but the amount of muscle pain itself can be reduced by a change in attitude.

“By turning our attention toward the phenomenon that we're afraid of and trying in essence to say ‘yes’ to the sensations, that whole aversion response tends to drop away,” he says.

Siegel cautions that people with unexplained pain should first consult a physician to make sure the pain is not a symptom of a serious illness. But if a physician finds nothing threatening, and the aches and pains themselves are the chief issue, then mindfulness may be an appropriate treatment.

Mindfulness, however, is not a panacea. Ironically, Siegel was already a Buddhist practitioner when he was struck down by back pain that left him mostly bedridden for months. As he describes in his book, *Back Sense*, it was only when he learned about the approach he now teaches that he was able to free himself from pain and resume a normal life.

“I totally worked myself into the syndrome despite the meditation practice,” Siegel says. “I did try meditating with the pain, but I believed that I was going to injure myself if I moved freely.”

That mistaken belief was enough to maintain his pain disorder. “That’s where the cognitive understanding is critical,” Siegel says. “It did help to have the practice once I learned what was really the matter.”

It may seem strange that we can feel intense pain sensations without anything major being wrong. In the West, until recently the standard view has been that physical pain is a warning sign of tissue damage, and that the greater the pain, the greater the damage. Called specificity theory, this model grew out of the ideas of French philosopher René Descartes. The theory came under challenge after World War II because of anomalies like the observation by U.S. Army doctor and Harvard Medical School anesthesiologist Henry K. Beecher that some soldiers who were severely wounded in battle appeared to suffer surprisingly little pain from their wounds.

The key figure in the modern understanding of pain was Ronald Melzack, a psychologist who did his research at McGill University in Montreal. In the 1960s, together with Kenneth Casey, Melzack proposed that the experience of pain was composed of distinct elements, including both a sensory component and an emotional one. As well, Melzack and his MIT colleague Patrick Wall proposed gate control theory, which explains how pain sensations can be amplified based on the amount of attention paid to them.

Melzack gained his insight into the distinction between pain sensations and suffering by paying close attention to the words his patients used to describe their pain. He noticed that people employed words like “shooting” or “cramping” that described sensory qualities, and other words like “punishing” or “terrifying” that described their emotional reactions. From his word list, Melzack developed the widely used McGill Pain Questionnaire and the notion that pain was a multidimensional experience.

Subsequent research verified Melzack’s hypothesis about the composite nature of pain.

Modern scientists no longer refer to a “pain center” but to a “pain matrix” in the brain, reflecting the understanding that several different brain regions contribute to the experience of pain.

Nerve fibers carry pain signals up the spine to a key branching point in the brain called the thalamus. From there, pain signals travel along one pathway to the somatosensory cortex, a brain region that contains a map of the human body. It records the sensory aspects of pain, and tells us *where* it hurts. Another pain pathway from the thalamus leads to the cingulate cortex. This region specializes in the unpleasantness of pain—telling us *that* it hurts.

Amazingly, people with damage to the cingulate cortex often report that pain doesn’t hurt. That is, if they choose to pay attention, they can identify sensations in the body that correspond to pain. But to them, pain lacks the urgent quality that demands attention. “They used to do limbic leucotomies for pain, which is basically zapping the anterior cingulate,” Alice Flaherty, a neurologist at Massachusetts General Hospital, told me. “People would say, ‘I don’t care about the pain anymore. I still feel it, but it’s not so obnoxious.’”

The cingulate—the word is derived from the Latin for “belt”—is a complex region with a number of different functions, but brain scans and anatomical studies indicate that one of its functions is to act as a neural alarm. It’s activated by physical pain, but also, as shown by the research of UCLA psychologist Naomi Eisenberger, by emotional distress like the sting of social rejection. The aversive component of both physical and emotional pain is perhaps best captured by the word *suffering*.

Our response to fear and our response to pain overlap in a subregion of the cingulate. This area prepares the body to flee. When alarmed, we tense our muscles so we can get away quickly. But as Ronald Siegel warns, if our muscles stay tense for a long time, this can lead to additional pain.

The good news is that although the feeling of alarm arises automatically, we can allow it to pass. Scientists like Naomi Eisenberger, among others, are finding that prefrontal regions of the brain, which are associated with conscious thought, are connected to the emotional areas and regulate them. When our senses take in something that might be threatening, the cingulate region generates the experience of suffering to force us to pay attention. The prefrontal regions then assess whether there really is a threat. If there is no threat—if what’s going on is *acceptable*—

the prefrontal regions seem to inhibit the neural alarm in the cingulate. We relax our muscles, take a deep breath, and feel relief.

Thus, when we experience pain sensations without fear, the sense of suffering falls off. This is the physiological foundation of the parable of the two arrows. The impact of the second arrow is due to our resistance. With acceptance, it disappears.

This understanding informs Mindfulness-Based Stress Reduction, the program developed by Jon Kabat-Zinn that is now offered at many health care centers. Carnegie-Mellon research psychologist J. David Creswell has reviewed studies of MBSR and its effect on pain.

“There seems to be a fairly consistent pattern of effect showing that mindfulness meditation is effective for reducing pain symptoms in chronic pain populations,” Creswell says.

However, he points out that mindfulness may not necessarily reduce the actual sensation of pain. “In fact,” he says, “I think that when you’re more mindful of pain, you’re actually experiencing the pain in a more direct way.”

Instead, mindfulness reduces the emotional suffering that normally accompanies pain, the second arrow in the Buddha’s parable. “I think that’s where the action is,” Creswell says. “There’s sort of a decoupling of one’s sensation of pain and the emotional response to that pain when you’re mindful.”

Creswell has some indirect evidence for this from a brain imaging study he conducted to test how mindfulness affects emotional pain. Creswell used a metric called the Mindful Attention Awareness Scale. It measures how predisposed a person is to focus on the present, based on answers to a series of questions such as, “I find myself listening to someone with one ear, doing something else at the same time.” Volunteers who were measured on this scale then had their brains scanned as they played a computer game designed to be emotionally distressing. Those more predisposed to be mindful rated the experience as less upsetting. Furthermore, the brain scans showed they had less activity in a subregion of the cingulate associated with suffering.

This is likely the target area where mindfulness has its impact on the second arrow, the aversive reaction to physical pain. Creswell is currently involved in a study to look at precisely this by testing people’s reactivity to physical pain before and after they complete an MBSR program.

It might seem like bare attention is too passive to affect our emotional reactions, but the brain is very active when we’re paying attention. “Just by simply observing and noticing how you’re responding, you are actually enlisting resources to regulate that response,” Creswell says.

Creswell attended a December 2008 meeting in Toronto that brought together about thirty-five clinicians and neuroscientists to discuss future directions for mindfulness research. Among those in attendance was Harvard Medical School neuroscience researcher Catherine Kerr. While Creswell sees mindfulness as protective against the second arrow of emotional suffering, Kerr thinks that mindful awareness of the body may have some impact on the first arrow, the pain sensations themselves. She’s done a pilot study that takes brain images of subjects as they mindfully shift awareness from one part of the body to another. One of the techniques taught in an MBSR program is the body scan method. This practice involves progressively bringing attention to the individual parts of the body, from head to toe.

“When you’re doing the body scan you focus on the toes and then you release the toes and you focus on the ankle or the bottom of the foot and you release it, and so on,” Kerr says. “The critical thing there is that you’re taking up the body part and then you learn to let it go. What you’re learning to do is to focus, maybe amplify the body part, but you also learn to inhibit it. The inhibition might be just as important as the amplification, especially for people with different types of chronic pain.”

Kerr cites evidence that the map of the human body within the brain’s somatosensory cortex reorganizes, based on the amount of attention paid to each body part. For instance, people who read Braille have more sensory territory devoted to the hand. Similarly, people who experience chronic back pain may have more neurons devoted to monitoring the back. Picture a distorted map in which a state’s size is based on the electoral votes it possesses, and so New Jersey looks bigger than Alaska. The distorted sensory map of a person in chronic pain would exaggerate the body parts in pain. Paying equal attention to all areas of the body using the body scan method may undo distorted body maps.

“Our theory is that meditation actually fine-tunes that ability to maintain sensory equanimity,” Kerr says. “That’s what we’re testing.”

There are at least two other ways by which our attention can affect the first arrow, the pure sensation of pain. Ronald Melzack and his colleague Patrick Wall described how pain signals from the extremities are filtered at the spine before they ever reach the brain. Like partygoers lined up before a nightclub's velvet ropes, pain signals clamor to get through. Whether the spinal gatekeepers admit them depends on instructions from on high. In the case of pain, signals from the brain pass down to the spine and tell the gatekeepers how exclusive they should be. "The descending pathway is usually a regulatory pathway. It could facilitate or it could inhibit," says Tarek Samad, a pharmaceuticals researcher and former assistant professor of anesthesia research at Harvard Medical School. "This is where emotional states or situations or environment affect the pain sensation." Depending on attitude and expectations, therefore, we can actually filter out pain before it reaches our consciousness. When we pay fearful attention to pain, however, we instruct the gates to open wide. As a result, we feel more intense pain.

The other way we can amplify pain is through the loop described by Ronald Siegel. When we experience fear, the brain sends signals to our muscles that tense them. When muscles are tensed for a long time, they start to hurt. When something starts to hurt, we become fearful, and we tense our muscles further.

The old Cartesian model of the pain system is simple but misleading. The real way the pain system works is not intuitively obvious, which makes the Buddha's insights into it all the more startling.

Reya Stevens is a Boston-based practitioner of Theravada Buddhism who teaches Buddhist approaches to dealing with illness. "Clinging," Stevens says, referring to the Buddha's second noble truth, "is all about not wanting something to be the way it is, or wanting something to stay the way it is—which can't happen because everything is constantly changing."

It's natural to reject what's unpleasant, but this often boomerangs. "If you get into a struggle with something, like trying to get rid of something or push it away, it has a tendency to actually make the thing worse," Stevens says.

Psychologists such as Harvard's Daniel Wegner have studied what happens when we try to suppress thoughts. Our brains operate in a continuous loop in which we check our present state for conflicts with our goals. This can have a paradoxical effect when

the goal is to control your own thoughts. Normally, you don't think about pink elephants. When trying *not* to think of them, however, you periodically ask yourself, "Am I thinking of a pink elephant?" The question itself produces the unwanted thought. Dartmouth researchers found that this checking behavior involves brain cells in the cingulate, though how it relates to the pain system is unclear.

Researchers at Dalhousie University in Nova Scotia and elsewhere have found that trying not to think about pain actually leads to more thoughts about pain. Feeling negative about pain makes pain hurt more. In mathematics, negating a negative produces a positive. Not so with pain. Pain serves as an alarm, and feeling alarmed about pain just piles it on.

If trying to suppress pain has the effect of magnifying it, can paying attention to pain actually alleviate suffering?

Yes, but the results may not be instantaneous, says Stevens.

"The issue for some people is they're starting meditation at a time when their pain is high and they don't have the luxury of building up slowly," she says. "Many meditators will not do well by just starting to be mindful of the bare sensations of pain right from the get-go because there is too much aversion. They'll have to start by being mindful of the reactivity to pain."

Another starting point is to be mindful of things that, although not physically painful, are often experienced as unpleasant, like road noise.

"Is it noise or is it sound?" she asks. "Inherent in the word 'noise' is your aversion to it. You're labeling it as unpleasant."

Stevens herself lives with considerable pain due to a chronic illness she's had since childhood.

"I recall a number of nights where I had a lot of burning pain in the body, but it was only on the right side," she says. "I sunk my attention into the left side of my body and really stayed mindful of the left side of the body. The distress that I felt over the pain in the right side of my body disappeared because my attention was able to settle itself into the left side to relax and let go. I fell asleep, pain and all. Many, many nights I've gone to sleep that way."

Shinzen Young, a mindfulness teacher based in Burlington, Vermont, is noted for his work with people in chronic pain. In his book *Break Through Pain*, Young describes his own breakthrough during a hundred-day retreat in primitive winter conditions

at a Buddhist monastery in Japan. He found that with concentration, the pain dissolved into a sort of energy he compares to a runner's high.

"It's almost certainly the case when a person is having a dramatic experience of pain breaking up that their endorphins are through the roof," Young says.

A brain imaging study conducted on athletes in Munich has shown that the euphoria that comes with vigorous exercise is due to the transmission of internal opioids such as endorphins to the cingulate and other regions. Placebos, which can be quite effective against pain, have also been shown to increase the body's flow of these morphine-like chemicals. So while Young's hypothesis has yet to be demonstrated in the laboratory, it may well be that we can release these pain-killing substances with sufficient mindfulness practice.

Young says that to deal effectively with pain, we need three things: the clarity to untangle the individual sensory elements, concentration to focus on each element, and the equanimity to experience each element without suffering. In addition to pain's sensory and emotional components, Young adds self-talk and the mental images that arise with pain. If we can apply mindfulness to each element, we can pick them off one by one.

Turning toward pain with acceptance is a key strategy that Young teaches. But he also says we can turn away from pain and concentrate on a more pleasant object, like the breath. Unlike a distraction strategy for coping with pain, which can be fleeting, with sufficient practice concentration can be more enduring.

Young says that while mindfulness is often defined as "nonjudgmental awareness," more precisely it's a question of equanimity.

"Nonjudgmentalness can be a factor of equanimity, but equanimity is broader concept," he says.

Equanimity does not mean passivity. So when one has a physical injury, or even the kind of pain that might indicate a heart attack, instead of panicking, one can mindfully apply good judgment and do what needs to be done.

"You can have equanimity with the physical sensations, the thoughts, and the feelings," Young says, "while you take objective action."

There is nothing inherently wrong with taking a pill to relieve pain. One can mindfully lay a tablet on the tongue, sip from a glass of water, and swallow. But if mindfulness can relieve the suffering from pain, and sometimes even pain sensations themselves, doesn't it make sense to give it a try? Mindfulness can also work as a complementary therapy in conjunction with medication. In cases of severe pain, drugs often fail to block all the pain. Mindfulness can help when drugs fall short.

The best time to learn how to apply mindfulness toward pain may be before one is in severe pain. It's like having an emergency kit available with you just in case you break down. We are all of the nature to grow old, to become ill, and to die. Few of us will escape from experiencing significant physical pain at one time or another. It helps to be prepared. Dodging one arrow is enough.

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