

SCIENCE AND RELIGION

A Painful Reality

Rick Heller

Why do absurd beliefs flourish in the United States? Sixty percent of Americans, for instance, “absolutely believe” that Jesus’ mother never had sex before giving birth to him, according to a 2003 Scripps-Howard poll. Theorists such as Daniel C. Dennett speculate that religion is a side effect of evolution, and that brain developments that made our ancestors more fit also gave rise to a hunger to believe. The way the central nervous system handles pain is consistent with this theory. Our internal pain system is highly responsive to expectations. Belief may be attractive because of its power to reduce sensitivity to pain.

Belief, in the form of the placebo effect, modulates pain in the brain, and perhaps even in the spinal cord. Though a 2001 paper by Danish researchers questioned whether a significant placebo effect exists, analyses have found three conditions that clearly respond to placebos: Parkinson’s disease, depression, and pain. Neural correlates of placebo analgesia—pain relief inspired by the intake of inert substances—have been identified in brain scans. One imaging study demonstrated that placebo-inspired beliefs activate opiates within the brain.

In addition to modulating physical pain, studies indicate what common sense tells us: belief can ease *emotional* pain. Placebo-inspired beliefs reduce activity in the anterior cingulate, a part of the cerebral cortex associated with the agony of both physical and emotional pain.

Like physical pain, emotional pain is adaptive. When something causes pain, we stop doing it and we avoid doing it

again. But sometimes life hurts, and there’s no easy escape. That’s when whiskey, narcotics, and religion come in handy. Each is a form of self-medication. Each has unpleasant side effects. A better understanding of how belief salves emotional pain might help us develop safer coping mechanisms.

Neuroscientists have identified two components of physical pain: sensory and affective. The sensory component is feeling in the body, produced by nerve signals that register in the somatosensory cortex, a brain region that tracks the position and amplitude of a stimulus. The sensory component, however, lacks the insistent quality that forces us to pay attention to pain.

The anterior cingulate is responsible for pain’s urgent quality, called its “affective” component. “They used to do limbic leucotomies for pain, which is basically zapping the anterior cingulate,” said Alice Flaherty, a neurologist at Massachusetts General Hospital, referring to a form of lobotomy. “People would say, ‘I don’t care about the pain any more. I still feel it, but it’s not so obnoxious.’”

When we feel emotional pain, we experience the affective component of pain without the sensory one. Recent studies have shown that applying the word *pain* to emotional suffering is not just an apt metaphor but a correct neurological description. In these studies, scientists inflicted pain on volunteers (though not to a degree that alarmed university ethics committees). At UCLA, Matthew Lieberman and colleagues inflicted emotional pain on volunteers while they were scanned by functional magnetic-resonance imaging

(fMRI). Subjects played a computer game of “cyberball,” which simulated tossing a ball among three players. The other “players” turned nasty, tossing only to each other and excluding the player being scanned. Subjects who indicated that they were upset at the unfair treatment had significantly higher activity in the part of the anterior cingulate that also activates during physical pain.

Tania Singer and her colleagues at the University College of London found similar results when they recruited couples in loving relationships and gave them electric shocks. A partner’s brain would be scanned while observing the loved one being shocked—thereby monitoring emotional empathy for the physical pain of others. The results showed that emotional pain corresponded with the affective component of pain but not the sensory.

In addition, both the Lieberman and Singer studies found that emotional pain correlated with activation in the insula, a part of the brain that monitors the internal organs. (This seems to correspond with the sense of emotional unease we call having “gut feelings.” Since internal organs cannot directly sense the outside world, they are likely responding to brain activity.)

But how does belief reduce pain? Another study by Lieberman sheds light on this. His collaborators inflicted physical pain on subjects being scanned with positron-emission tomography (PET). People with irritable bowel syndrome were twice subjected to a colonoscopy-like procedure. The first time, they did not receive real or even sham medication. For the next three weeks, they were given a placebo that supposedly treated irritable bowel syndrome and were asked to keep a pain diary in which they rated their symptoms on a numeric scale. They then went through the rectal procedure and scan once again. Pain relief over the course of placebo treatment correlated with reduced activity in a subject’s anterior cingulate. It also correlated with increased activity in the right ventrolateral prefrontal cortex. This area of the brain, according to Lieberman, is involved when we mentally override habitual behavior.

Jon-Kar Zubieta and colleagues at the University of Michigan inflicted muscular pain on volunteers, treated

the pain with placebos, and scanned the subjects with PET. They detected increased neurotransmission of internal opiates in parts of the anterior cingulate among those who experienced placebo pain relief. The results were consistent with older studies that found that naloxone, an antidote for narcotics, also blocks placebo analgesia.

In a phone interview, Lieberman said, “The placebo effect doesn’t necessarily have anything to do with the pill whatsoever. It has more to do with expectation, belief, and also conditioning.” In various studies of the placebo effect, the deceptions used to inspire belief have included inert creams, saline injections, sham surgery, and even magnets. As far as why our pain system responds to belief, Lieberman suggests that it may be adaptive to inhibit pain at times, such as when fleeing from a predator.

If belief in a placebo stimulates opioid transmission and reduces activity in the anterior cingulate, and if anterior-cingulate activity correlates with the unpleasantness of both physical and emotional pain, could placebo analgesia reduce emotional pain? I put this to Lieberman. Yes,” he said, “that seems like a very plausible claim, although untested.” When Marx called religion the opiate of the masses, was he *literally* correct?

Religion cannot be reduced to emotional analgesia, but it’s a key selling point. The first of Buddha’s Four Noble Truths is translated as “Life is suffering.” Buddhists even distinguish between pain and suffering in a manner that parallels the distinction between sensory and affective. One insightful teaching is that pain accepted without alarm causes little suffering.


Christianity is focused on pain. Most religions boast of a powerful god, but the crucified god of Christian myth has a counterintuitive appeal to individuals in pain. The death of loved ones, of course, is a great source of emotional pain; expecting to reunite with them in the hereafter modulates pain in the here and now. This analgesic property of Christian faith is expressed in a saying attributed to the apostle Paul: “We grieve but not as others do who have no hope.”

To the extent that a religion generates placebo effects, it provides real relief from suffering. It is belief itself—not supernatural power—that provides

the pain relief. It's perfectly understandable that people turn to faith in times of stress.

Among American Christians, the once-dominant mainline denominations have hemorrhaged members while evangelical, fundamentalist, and Pentecostal denominations have gained adherents. By accepting scientific theories like evolution, moderate religious groups may provide less emotional analgesia than denominations that insist that miracles have occurred in the past and will occur in the future.

Escapist religious fantasies succeed in the marketplace of emotions, but they have a downside, of course. A certain amount of faith can make us feel better. Excessive enthusiasm can lead to spectacular failure when an expected miracle does not arrive. The religions that survive for generations find a way to temper expectations.

Is there a rational alternative to religion that could harness the placebo's power over physical and emotional pain? That's debatable. Any pharmaceutical that stimulates the internal opiate system is likely to be addictive and, therefore, a source of future social pain. The placebo works not just through belief but through deception. As Matthew Lieberman told me, "Self-deception doesn't work if you know you're doing it." 

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