



University of Pennsylvania  
**ScholarlyCommons**

---

Neuroethics Publications

Center for Neuroscience & Society

---

July 2007

## "Cosmetic Neurology" and the problem of pain

Anjan Chatterjee

University of Pennsylvania, [anjan@mail.med.upenn.edu](mailto:anjan@mail.med.upenn.edu)

Follow this and additional works at: [https://repository.upenn.edu/neuroethics\\_pubs](https://repository.upenn.edu/neuroethics_pubs)

---

### Recommended Citation

Chatterjee, A. (2007). "Cosmetic Neurology" and the problem of pain. Retrieved from [https://repository.upenn.edu/neuroethics\\_pubs/43](https://repository.upenn.edu/neuroethics_pubs/43)

Postprint version. Published in *Cerebrum*, July 30, 2007.

Publisher URL: <http://www.dana.org/news/cerebrum/detail.aspx?id=8794>

This paper is posted at ScholarlyCommons. [https://repository.upenn.edu/neuroethics\\_pubs/43](https://repository.upenn.edu/neuroethics_pubs/43)  
For more information, please contact [repository@pobox.upenn.edu](mailto:repository@pobox.upenn.edu).

---

## "Cosmetic Neurology" and the problem of pain

### Abstract

Few people would argue against treating the traumatic psychological effects of war or violence. But what about taking a drug to lessen the pain of our common daily struggles, such as the end of a relationship or anxiety about one's job? Is this a "cosmetic" enhancement of human life, even a danger to character, or is it an ethical choice? For guidance, the author looks to the history of treating physical pain and argues that, despite growing knowledge of the biological basis for psychological pain, many find it hard to find a consistent principled position when it comes down to specific instances of alleviating human suffering

### Keywords

enhancement, cosmetic neurology, pain, neuroethics

### Comments

Postprint version. Published in *Cerebrum*, July 30, 2007.

Publisher URL: <http://www.dana.org/news/cerebrum/detail.aspx?id=8794>

When is using medication to lessen psychological pain an ethically defensible choice?

## "Cosmetic Neurology" and the Problem of Pain

By Anjan Chatterjee, M.D.

July 30, 2007

*Few people would argue against treating the traumatic psychological effects of war or violence. But what about taking a drug to lessen the pain of our common daily struggles, such as the end of a relationship or anxiety about one's job? Is this a "cosmetic" enhancement of human life, even a danger to character, or is it an ethical choice? For guidance, the author looks to the history of treating physical pain and argues that, despite growing knowledge of the biological basis for psychological pain, many find it hard to find a consistent principled position when it comes down to specific instances of alleviating human suffering.*

We are all familiar with—and many are troubled by—athletes who use medications, legal or otherwise, to enhance their performance. This practice is an early indication of a much larger trend. As neuroscience advances, we are getting better at treating cognitive and emotional disorders, and we are also learning how to improve cognition and modify emotions in basically normal, healthy people—for example, by increasing alertness or lessening fear. I have coined the term “cosmetic neurology” for this practice.<sup>1</sup>

Cosmetic neurology raises four major ethical concerns. First is a concern about safety. We weigh the potential risks and side effects of a new medication for a disease against the potential benefits. In health, are any risks worth taking? For example, musicians often use beta-blockers to dampen tremors and anxiety associated with public performance. Occasionally, however, beta-blockers are associated with a life-threatening anaphylactic (allergic) reaction in which it's not always clear that an individual would be better off without the drug. What some might see as a dubious or even dangerous enhancement, others believe is an ethical means of relieving suffering. person's blood pressure drops and breathing stops. Is the better concert worth this risk? Second is a concern about distributive justice: If cosmetic neurology succeeds in making people smarter and happier, will these enhancements be available disproportionately to the affluent? Third is a concern about coercion. Will healthy people be or feel forced to take such medications, either because it would serve a greater good (for example, airline pilots being required to take a drug to increase alertness if that made flying safer) or because of competitive pressures?

Finally—and this is the focus of this article—ethicists and others have expressed a subtle but deep concern about ways in which manipulating our emotional lives might erode character, both individually and communally. This was a fundamental concern raised by the Presidential Commission on Bioethics and highlighted in its 2003 report, *Beyond*

*Therapy.*<sup>2</sup> If, as many religions and philosophies argue, struggle and even pain are important to the development of character, does the use of pharmacological interventions to ameliorate our struggles undermine this essential process?

The widespread practice of cosmetic neurology seems inevitable, and resolving this concern will not be easy. Many people share an underlying discomfort with how things might play out. But when we consider specific instances of using a medication to affect emotion and treat psychological pain, it's not always clear that an individual would be better off without the drug. What some might see as a dubious or even dangerous enhancement, others believe is an ethical means of relieving suffering.

In my view, the history of the treatment of physical pain, including “natural” pain, anticipates the treatment of psychological pain. Similar tensions are certainly at play. This claim is predictive, not prescriptive—I am neither advocating nor decrying the use of cosmetic neurology. I am, instead, pointing out how deeply difficult it is for anyone, ethicists included, to adopt a consistently principled position on the problem of pain.

## **The Varieties of Cosmetic Neurology**

The pharmaceutical and other interventions that we place under the heading of cosmetic neurology target the human motor, cognitive, and emotional systems. The functioning of our motor system can be enhanced by influencing the cardiovascular, peripheral motor, and central nervous systems. For example, both the hormone erythropoietin and the drug sildenafil can be used by athletes to increase the oxygen-carrying capacities of their blood and provide better endurance, and drugs that act on receptors for the neurotransmitter dopamine may very well improve our ability to learn new motor skills.

Attention, memory, and learning can also be altered in healthy people, sometimes with drugs developed to treat a disease and sometimes with treatments created specifically to enhance cognitive abilities. Medication that boosts the effects of the neurotransmitter acetylcholine, used widely to treat symptoms of Alzheimer's disease, has been shown to improve alertness and attention in healthy people, as has modafinil, a drug used to treat sleep disorders such as narcolepsy. Stimulants such as atomoxetine, which is used to treat attention deficit disorder, are also likely to improve levels of alertness in normal individuals. In addition to these currently available drugs, new classes of drugs that could be used as cognitive enhancers are being investigated. Some of these promote structural changes in neurons that accompany the acquisition of long-term memories. These drugs—molecules with names like “ampakines” and “cyclic AMP response element binding protein modulators” that may one day sound as familiar as “statins” do today—are designed not to treat pathology but to exploit normal biological processes, with the hopes of improving memory.

Finally, and most relevant to this discussion, our understanding of the brain basis of emotions continues to grow, as does our ability to modify the systems related to various emotions. Take, for example, fear. It is clear that a brain structure Most reasonable people agree on the urgent need to ease the psychological burdens imposed by significantly

traumatic events. called the amygdala, located within the temporal lobe, is involved in regulating the effects of fear and our responses to it.<sup>3</sup> The amygdala receives signals from pain pathways, from higher-order perceptual processing areas, and from the hippocampus, an area long known to be essential to the formation of memory. The amygdala, in turn, sends signals to the hypothalamus, which regulates stress hormonal responses, and to areas of the brain that regulate arousal, such as the locus ceruleus. Thus, the amygdala is a critical structure that controls our experience of fear and colors our perception and memory of fearful events. As shown in recent experiments<sup>4</sup>, the effects of fear on memories can be dampened by local infusions of beta-blockers (long used to treat high blood pressure), thereby helping with symptoms of anxiety.

The drugs called serotonin reuptake inhibitors (SSRIs) are commonly used to treat depression and anxiety, but they could have wider applications. For instance, research on primates has shown that infant monkeys that have been abused have lower serotonin levels in their brains than those who have not been maltreated, and those infants with the lowest levels are more likely to become abusive adults. Humans with a specific form of a serotonin transporter gene have abnormal amygdala activity and are especially prone to fear and anxiety, as well as to the effects of abuse. In healthy people, SSRIs promote “affiliative behavior,” or friendly positive behavior toward others. So one might argue that these drugs should be used even more widely than is the current practice.

Just around the corner are several new ways of potentially controlling affective (mood) states by regulating neuropeptides, small proteins in the brain that influence how information is processed and that can be linked to quite specific behaviors. One such neuropeptide, corticotropin release factor, seems to influence neural changes produced by ongoing stress. These changes include lowered levels of neurotransmitters that influence attention and mood, such as serotonin, epinephrine and dopamine. Blocking corticotropin releasing factor, which would lower glucocorticoid levels, might blunt these long-term effects of stress. The hormone oxytocin might be used to induce trust. Other neuropeptides, such as substance P, vasopressin, galanin, and neuropeptide Y, are also being studied as potential targets for treating the brain’s emotional functions.

## **Psychological Pain**

Most reasonable people agree on the urgent need to ease the psychological burdens imposed by significantly traumatic events. For instance, thousands of young men and women experience varying degrees of post-traumatic stress disorder following military service, and many of them fall through the cracks in our society. Few people would argue against treating such individuals, in the same way that few would argue against treating their physical ailments—even if, in practice, we fall short of treating either type of affliction.

But what about less-severe traumas, or even the challenges of everyday life? Preliminary research suggests that beta-blockers may prevent post-traumatic stress symptoms when given to people who have gone to the emergency room after a car accident. In addition to dampening the emotional effects of memories after they form (retroactively),

such Approaches to the problem of pain have historic precedents in the treatment of physical pain, particularly the use of anesthesia to ease the pain of surgery and of childbirth. medications could presumably be used proactively, when the memories are first encoded. If they are proven effective, and more such treatments become available soon, how widely would they be used? We could expect people to employ them for all sorts of “normal” traumas, such as remorse over wrongdoing or breakups in relationships and the other losses and disappointments that seem integral to our existence as humans.

But what would be the long-term consequences of flattening these bumps in the road? Do we need the experience of pain to develop character? Beyond individual development, what is the role of pain in binding us communally? Researchers have learned that empathy for the experience of pain in others may be made possible by the observer’s own neural pain circuits, particularly through the anterior cingulate and the insula. If pain circuits are chronically dampened, would a person still be capable of empathy? Would our society be less caring of marginalized groups, such as those with mental illnesses and other disabilities?

## **Anesthesia for Physical Pain**

Approaches to the problem of pain have historic precedents in the treatment of physical pain, particularly the use of anesthesia to ease the pain of surgery and of childbirth.<sup>5</sup> In October 1846, William T. G. Morton, a dentist in Boston, gave the first public demonstration of the use of anesthesia in surgery; and on January 19, 1847, James Young Simpson, a Scottish obstetrician, used ether to facilitate the delivery of a child by a woman with a deformed pelvis. Simpson became a forceful advocate of the wide use of anesthesia for childbirth, a practice that was extremely controversial at the time. Medical discussions about the benefits and risks of anesthesia played a relatively minor role. At the heart of the objections was the social construction of the meaning of pain. In this light, treatment of pain was objectionable on three grounds.

*Pain as Natural.* First, don’t mess with Mother Nature. Some pains are natural. We should not be meddling with the natural course of things, since we are not wise enough to predict the unintended consequences of our meddlesome ways.

From the very beginning, some obstetricians objected to the use of anesthesia for childbirth on grounds that childbirth was natural and interventions such as the use of ether or chloroform invited medical disaster. As physicians took the possibility of side effects seriously and tried to mitigate them, safety became less of a concern and the popularity of anesthesia continued to rise. But the appeal of all things natural resurfaced with force in the mid 20<sup>th</sup> century, when Grant Dick Read promoted the natural childbirth movement and Ferdinand Lamaze published *Painless Childbirth*. A professional rivalry between Read and Lamaze increased the public’s awareness of the possibilities of natural childbirth, and in 1956 Pope Pius XXII gave a special address on the moral value of natural childbirth, giving these approaches spiritual weight. This address coincided with a period in which the public was losing confidence in medicine’s ability to alleviate illness and pain.

*Pain as Punishment.* Second, spare the rod, spoil the child. Sometimes we deserve to be punished. Pain, as a form of punishment, structures individuals and orders our society. To mitigate pain would make for a society of sinners as we succumb to our lesser angels.

Pain plays a central role in many religious traditions and is often viewed as an acknowledgment of human imperfection. The link between the pain of childbirth and punishment is made explicitly in Genesis 3:16: “Unto the woman he said, I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children.” The notion of pain and suffering as deserved is evident in other traditions as well, and self-infliction of pain as an act of atonement remains prominent in Christian, Muslim, and Hindu belief. Similar views of the role of pain as punishment can be observed in secular institutions. For many years, brutal public executions were sanctioned to serve as both public entertainment and education. Humanists debated the use of pain in legal systems, and despite prison reform movements, the general impression that social order would disintegrate if the law did not use its authority to punish and inflict pain remains robust. In this view, relieving deserved pain would be hubris at best, and more likely an invitation to chaos.

*Pain as Progress.* Third, no pain, no gain. Learning to cope with pain strengthens and deepens us. Mitigating pain could cheapen us, individually and communally.

In spiritual frameworks, pain serves as a vehicle for transcendence. The Christian symbol of the cross exemplifies the link of sacrifice and salvation. In secular views, pain builds character. Writers have explored the experience of pain and suffering as integral to larger-than-life characters in literature, such as Hamlet and Faustus. F. Scott Fitzgerald claimed, “You especially have to hurt like hell before you can write seriously,”<sup>5</sup> a sentiment echoed by others who have linked pain to creativity.

Pain also serves to strengthen social bonds. Religious views that a God that punished also healed meant that communities rejoiced together in that healing. The pain of childbirth and the real possibility of death meant that neighbors and family and friends supported the event in a way that often formed lifelong social bonds. As childbirth moved from the home to hospitals in technically developed countries, many of the rich social and cultural traditions were reduced to ritualistic baby showers. Perhaps in partial reaction to this sterile approach, in 1948 the Royal College of Obstetrics and Gynecology found that half of 15,000 British women interviewed preferred delivery in their home, which meant with a midwife and without anesthesia. Such attitudes fluctuate over time, but concerns about the “medicalization” of childbirth remain germane today. In 2002, the British Medical Journal devoted a special issue (Vol. 324, 13 April) to discussions of medicalization trends in general, and note with some alarm the rise in Cesarean section deliveries and the inappropriate use of fetal monitoring.

## **Reinterpreting Physical Pain**

Despite the various ways in which the treatment of physical pain was (and sometimes continues to be) viewed with mistrust, the use of medications and anesthesia for pain management is now widespread. Indeed, a growing international consensus calls for effective treatment of pain as a fundamental human right.

Two reinterpretations of pain facilitated this change. First, the classification of pain as a biological phenomenon diluted the impact of religious interpretations. When Simpson began administering ether to women giving birth, he emphasized that the pain of childbirth was a consequence of anatomy and not divine wrath, even suggesting that God was an advocate of anesthesia, as evidenced by his putting Adam into a deep sleep to extract the rib that would become Eve. In the early 20<sup>th</sup> century, the physiologist Sir Charles Sherrington observed that complex behavior could be analyzed as a set of coordinated neural reflexes. The discovery of various sensory receptors and the signaling of pain by specific neural pathways made explicit the possibility that pain could be altered, lessened, or even blocked. This mapping of physical pain onto its biology helped frame the treatment of pain as simply one more mechanical manipulation.

Second, in the late 19<sup>th</sup> century, the public attitude toward pain and suffering of all kinds shifted. William James wrote, “A strange moral transformation has, within the past century, swept over our Western world. We no longer think that we are called on to face physical pain with equanimity. . . . The way our ancestors looked upon pain as an eternal ingredient of the world order, and both caused and suffered it as a matter-of-course portion of their day’s work, fills us with amazement.”<sup>5</sup> This transformation occurred in the setting of broad-based humanitarian movements dedicated to the relief of suffering in many forms. Women’s suffrage, and abolitionist, prison reform, child labor reform, and anti-vivisectionist movements gathered force during this period. Alleviating physical pain fell naturally within the purview of these humanitarian efforts.

## **Psychological Pain as Biological**

In exploring ethical concerns about anesthetizing psychological pain, the differences between it and physical pain are less relevant than the similarities of their underlying neurobiology and, therefore, of their socially constructed meaning.

Physical pain produces neural responses that fractionate into three components.<sup>6</sup> First is the sensory experience itself, which is processed in the brain by parts of the somatosensory cortex and by a deep structure called the thalamus. As such understanding of the neurobiology of emotional systems deepens, treatment of psychological pain becomes easier to view as a mechanical rather than a metaphysical manipulation. Second is the subjective sense of “unpleasantness,” which is often, but not always, correlated with the intensity of the pain sensation. This subjective sense of unpleasantness is accompanied by neural activity in the insula, which controls our autonomic nervous system, and the anterior cingulate, which integrates the cognitive experience of pain with its emotional aspects and establishes priorities for responding to the pain.



Finally, pain also produces what is called the “secondary pain affect,” which refers to emotional feelings about the long-term implications of having pain that can last long after the inciting physical pain. The neural basis of the secondary pain affect is not well understood, but it is thought to emerge from an interaction of the anterior cingulate, insula, amygdala, and prefrontal cortex. These same parts of the brain are also part of the distributed network that coordinates emotional distress and its interactions with our cognitive systems. We can see how physical and emotional pain converge in the brain.

As such understanding of the neurobiology of emotional systems deepens, treatment of psychological pain becomes easier to view as a mechanical rather than a metaphysical manipulation. Similarly, it is hard not to see such intervention in humanitarian terms, rather than as a cosmetic “enhancement.” In addition to the wave of post-traumatic stress disorder that will soon be upon us as a result of veterans returning from the Iraq war, some estimate more than a quarter of the American population suffer from affective or addictive disorders.<sup>7</sup> How could anybody object seriously to the alleviation of this suffering, even if it means that others might take the same pills for more trivial reasons?

### **The Ethical Dilemma of Pain**

We face a fundamental problem in trying to establish a coherent ethical position on ameliorating psychological pain. The general unease shared by most people about ubiquitous treatments of such pain coexists with competing and conflicting attitudes about specific situations.

We can worry about loss of character individually and communally at the same time that we are willing to frame psychological pain in biological terms or consider its treatment a broad humanitarian goal. We might share the general sense that some things are best left alone, but we are unlikely to agree on which specific things are best left alone. We might share the general sense that pain serves a purpose in establishing order, but we are unlikely to agree on which. My claim is not that everyone will use medications to alleviate the bumps and bruises of everyday living. It is that more and more medications will become available for this purpose and at least some people will find it ethically acceptable to use them. Pains can be justified and for whose version of order. We might share the general sense that pain can be a vehicle for character development, but we are unlikely to agree on which specific pains are worth enduring for a greater good. If the same person weighs these considerations differently for each situation, and changes the relative weightings of these considerations for the same situation at different times, then how could one possibly have a coherent reflective position?

The holding of contradictory beliefs with unstable relative weightings makes it extremely unlikely that ethicists, as a group, will be able to speak with one voice. As a result, they will be unlikely to shape social norms that could guide a coherent practice of anesthetizing psychological pain or provide a basis for public policy. Without such restraint, aspects of cosmetic neurology, at least the practice of modifying emotional systems in basically healthy people to lessen suffering, great or small, will flourish.

My claim is not that everyone will use medications to alleviate the bumps and bruises of everyday living. It is that more and more medications will become available for this purpose and at least some people will find it ethically acceptable to use them. Anesthesia for childbirth is available to virtually everybody in technically developed countries, but some choose to use it and some do not. The extent of general use of interventions for psychological pain will fluctuate with people's faith or frustration with science, technology, and medicine.

## **Acknowledgments**

I would like to thank Lisa Santer and Barry Schwartz for their helpful comments on an early draft of this paper.

## **References**

1. Chatterjee A. Cosmetic neurology: The controversy over enhancing movement, mentation, and mood. *Neurology*. 2004;63:968–974.
2. *President's Council on Bioethics. Beyond Therapy: Biotechnology and the Pursuit of Happiness* 2003.
3. LeDoux J. Emotion circuits in the brain. *Annual Review of Neuroscience*. 2000;23:155–184.
4. McGaugh JL. The amygdala modulates the consolidation of memories of emotional experiences. *Annual Review of Neurosciences*. 2004;27:1-28.
5. Caton D. *What a blessing she had chloroform: the medical and social response to the pain of childbirth from 1800 to the present*. New Haven, Connecticut: Yale University Press, 1999.
6. Price D. Psychological and neural mechanisms of the affective dimension of pain. *Science*. 2000;288:1769–1772.

## **About Anjan Chatterjee, M.D.**

**Anjan Chatterjee, M.D.**, is an associate professor at the Center for Cognitive Neuroscience, University of Pennsylvania School of Medicine. His research focuses on human cognition, especially language and meaning, visual aesthetics, and visual, spatial, and temporal processing. He is also interested in the ethical dilemmas arising from advances in clinical and basic neuroscience.