

ON HUMAN NATURE

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Sano di Pietro, Initial D: The Torture of Saint Agatha, c. 1460

Minding the Pain

In an early scene of the recently released version of David Lean's 1962 film *Lawrence of Arabia*, the hero holds his hand over a candle flame for what seems an impossibly long time. "Doesn't it hurt?" ask his companions. "Of course it hurts," replies the soldier and author Thomas Edward Lawrence, who is portrayed by Peter O'Toole. "The trick is not minding that it hurts."

We humans have a bit of a love affair with pain or more precisely with our ability to withstand it. Indeed, our tolerance for pain is fundamental to how we perceive our bodies and minds. It is a kind of boundary, defining the limits of our mettle. Now and then we make phantom excursions to that perilous border. Drifting into nightmarish fantasies of terrorism and persecution, capture and torture, we ask ourselves: How much could I take? What would make me give in? Whom would I betray? We don't have to singe our palms in order to puzzle out these questions with an eerie, almost perverse fascination.

Most of us, fortunately, will miss out on the chance to answer them in anything like the imagined situations. But few people last a normal life span without having

at least a brush with the pain of illness or injury. The stabbing sensation of a kidney stone, the agony of migraine, the explosive force of childbirth, the long, dull, turbulent ache of nausea, the chest-crushing weight of a gasping heart, the dispiriting, ever worsening, seemingly endless hurt of some terminal cancers—all tell us how much we can stand (and how we can manage it). Surely such pains are as vivid as most varieties of political torture, and more so, no doubt, than anything one is likely to experience in the candle game.

The physician's ability to soothe pain has been the mark of the medical profession since time immemorial. According to some philosophers, the experience of pain is so subjective that none of us can ever be sure another person is having it. But doctors seem to have resolved this dilemma in a commonsensical way: they simply treat the pain as if it were real, and their track record in battling this inscrutable condition has made them the most revered of professionals.

Pain is real, of course. If there is anything on which people the world over can agree, it is this immutable, uncomfortable truth. There are, however, vast dif-

ferences in the ways individuals, and even entire cultures, feel, face and interpret this universal experience. How much do these differences matter? And what lessons can we learn from them about the mind (and beyond that, about the cultural framework of language and symbol) that can alter the subjective reality of bodily anguish? In short, to what extent do physiology and culture determine how much pain we can take before crying uncle?

Although anthropologists have not yet taken a particular interest in pain, the sensation frequently forces its way into their consciousness, especially as they go about documenting customs appreciably more violent than the candle game. Among some North American Plains Indians, for instance, captive fighters were expected to die well under torture, and their public display of courage was as much a source of pride to them as the ingenuity of the torture was to their gloating enemies. For the Oglala, natives of what is now South Dakota, self-inflicted pain was crucial to a religious ceremony that has become known as the sun dance. Sharp bone shafts, tied to one

end of a rope, were dug firmly into the skin of a man's chest. The other end of the rope was then fastened with leather thongs to a pole. After first ensuring the rope was taut, the impaled man would dance until the shafts tore away from his flesh. Gruesome by our own cultural standards, the sun dance normally was performed as grateful payment to the gods by someone who had been bailed out of some kind of trouble.

For the Australian aborigines the ability to bear pain was an essential element in the rite of passage into puberty. Slicing open the underside of a teenage boy's penis was the culturally prescribed way of testing his courage—and of making him a man. And in any number of African societies, to stoically suffer transformations of the body ranging from facial scarification to the removal of the clitoris was considered a sign of adulthood. These rituals also have other functions, of course; clitoridectomy, for instance, was meant not just as a test of the ability to endure pain but also as a way of controlling women. Nevertheless, courageously facing pain was part and parcel of the ritual. The Judeo-Christian tradition, of course, is no stranger to martyrdom and self-mortification. That this cross-cultural tendency is not just about machismo is shown by the saying "Beauty knows no pain," which has been cited to justify devices of torture from suffocating girdles to toe-crushing high-heeled shoes.

In fact, it could be argued that the human ability to tolerate pain developed precisely in the most feminine possible context: childbirth. As we evolved from our ape ancestor, the need for a pelvis sturdy enough to enable the upright human posture ran counter to the bulging of our brain. The trend toward larger brains—greater intelligence—made infants' heads larger, even as the pelvis became more of a stiff, weight-bearing organ. This led to what anthropologists know as the great evolutionary squeeze—a big baby's head shoving its way out through a stubborn pelvis.

One of the more unusual ways of handling childbirth, which is practiced by the !Kung of Botswana, is for a woman to go it alone. As documented by Marjorie Shostak of Emory University, most women attain this ideal after giving birth for the second time. Feeling the labor pains, they leave the village quietly, calling for help if they need it, preferably after the birth; the ideal is simply to walk back with the baby. The women are explicit that it is a matter of courage. They also say that fear makes for disastrous births. This custom hints that courage, specifically the capacity to withstand excruciating pain, could have evolved independently of men—the tradition of

the strutting tough guy notwithstanding.

There is no doubt that, in spite of running much greater risks, !Kung women endure the pain of childbirth a good deal more stoically than most American women. They probably owe their equanimity to their cultural framework for managing fear: extensive social support in the first birth is followed in subsequent births by a gradual transfer of responsibility—and of empowerment—to the laboring mother herself. Eventually women achieve their ideal of solitary childbirth, having undergone the development of pain tolerance in a uniquely demanding cultural setting.

Similarly, an experimental study of veteran Nepalese mountain porters showed that after a lifetime of trekking through hard terrain they were not as distressed as Westerners by the same level of physical pain. Given electric jolts that would make the average American cry out, the imperceptible porters rarely did more than describe the experience as "painful," or perhaps "very painful." Their understated reactions reflected long exposure to harsh living conditions, in which they grew accustomed to lugging eighty-pound packs at high altitudes, wearing only light clothing even at freezing temperatures.

Even American subcultures differ in their responses to pain. A classic study by anthropologist Mark Zborowski on patients in a Bronx, New York, hospital compared Italian-Americans and Jewish-Americans with so-called Old Americans, mainly white Anglo-Saxon Protestants. Both Italian-Americans and Jewish-Americans complained and, on occasion, even cried about their pain, whereas the Old Americans generally kept stiff upper lips. The Italian-American subjects, however, put great faith in their physicians and were satisfied once the pain was treated. The Old Americans and the Jewish-Americans, on the other hand, were more skeptical of modern medicine. In fact, some of the latter were so anxious about the significance of their pain they wanted to keep it—miserable as it made them—in order not to be lulled into a false sense of security about the underlying disease.

These and other findings show that learned behavior and psychological factors generally exert a powerful influence on the degree of pain experienced for a given injury. Hypnosis, suggestion, preparedness, biofeedback—all have been proved to modulate the perception of pain in a large proportion of victims. Yet much remains to be understood about how the body and brain process pain, and medical science is even further from an explanation of how the "top down," or psychological, elements work.

What we do know comes largely from analyzing the effects of drugs that have been used by various cultures to fight pain and have been refined by Western pharmacology. The study of these substances at work offers a systematic approach to fathoming how the body delivers a painful sensation from the site of injury to the core of the self. And interestingly enough, painkilling drugs have origins as geographically wide and historically deep as some of the ancient cultural methods of pain management. The attempt to manage pain with natural plant-derived remedies is probably as old as our species. Physicians like to think they have invented most important drugs, based on their special knowledge of how the body works. But as far as drugs for pain go, something like the reverse has been true.

Aspirin, for instance, comes from a compound found in the bark of the willow tree, which was used traditionally by the Cherokee and other Indians native to the eastern woodlands of North America. The Reverend Edmund Stone reported to the Royal Society of London in 1763 that he had tasted it, presumed it was medicinal and given it to about fifty people suffering from rheumatoid arthritis; he claimed benefit to all of them. Two centuries of clinical experience, billions of doses and thousands of modern experiments finally showed how this remarkable substance works. Prostaglandins—chemicals produced in and released from virtually all mammalian cells upon injury—cause local nagging pain by sensitizing nerve endings; aspirin and other, similar drugs (such as indomethacin and ibuprofen) keep prostaglandins from being made. They interfere with an enzyme known as prostaglandin synthetase, or cyclooxygenase, and their effectiveness against pain is proportional to their success in blocking this enzyme at the site of injury.

The rush of prostaglandins represents the first step of pain delivery, and the only one that does not depend on the nervous system. Whether it is a persistent muscular ache or the instantaneous stab caused by burning or cutting, the next link in the pain chain involves the nerves feeding into the spinal cord. We are certain that these nerves carry the message of pain, thanks in large part to research into the action of another drug, cocaine. Cocaine was first purified in 1860 from the leaves of the coca plant, traditionally chewed by the Indians of Peru. By applying cocaine locally to the skin or the eye, nineteenth-century German and Austrian investigators (Sigmund Freud among them) adapted it to dull the pain of surgery rather than to bring about the systemic effect that has made it such a popular item on the street today.

Cocaine and other drugs that resemble

it, such as novocaine and xylocaine, all work the same way—by blocking the electrical discharge of a nerve. The long tubular membrane of the nerve cell carries electricity, and when the discharge gets to the spinal cord, a pain-signaling chemical known as substance P (actually a chain of eleven amino acids) is released there, which then excites nearby neurons to send impulses traveling to the brain. But the local anesthetic makes the membrane unresponsive: it either increases the surface pressure of the lipid molecules in the membrane or disorders them; either way the flow of sodium ions through the membrane stops, making the nerve electrically quiescent. In any case, nerve conduction is blocked, no substance P is released and no painful message is sent to the brain. The blockade of the release of substance P has also been shown to result from experimental electrical stimulation of certain higher brain regions, especially a brainstem region known as the periaqueductal gray; this has helped provide a basis for understanding the psychological modulation of pain, since the brain is seen to be modifying secretions of the spinal cord.

Some of the most intriguing discoveries in the study of pain have involved the brain itself—the supervising organ that notices the pain and that sends messages down to the spinal cord to regulate incoming pain traffic. Here too, as with aspirin and cocaine, the story began with drugs known for centuries. Opium, as well as its derivatives heroin and morphine—named for Morpheus, the Greek god of dreams—comes from the poppy plant. Its seeds have been found by archaeologists in excavations of Swiss lake dwellings 6,000 years old, and more than 3,000 years ago its use was reported in Egypt.

Yet it was not until the early 1970s that experiments began to reveal how morphine works. Avram Goldstein of Stanford University, Candace Pert of the National Institute of Mental Health, Solomon H. Snyder of Johns Hopkins University and others guessed that there might be receptors—locks fitted by a chemical key—for morphine in the brain. In 1973, having found and mapped them using radioassay techniques, they speculated that the brain wouldn't have built-in receptors for morphine unless it also had a similar substance of its own. And within a couple of years "the brain's own morphine"—the famous endorphins—had been accurately described as a class of small peptides, most of which are made up of five amino acids.

Endorphins have provided more insights into pain during the past decade than had been gained in all the previous history of science. They may also help explain many individual differences in

response to pain—since one must assume that people differ in their ability to produce endorphins. It now appears that a number of techniques for blocking chronic pain—such as acupuncture and electrical stimulation of the central brainstem—involve the release of endorphins in the brain and spinal cord. Endorphins have also been found to be elevated in long-distance running and in pregnancy and labor. Even prolonged stress apparently makes us produce more endorphins.

Pain relief is not the sole province of endorphins, however. Hypnosis blocks pain without releasing these chemicals, as do certain kinds of brain damage. Although now deservedly maligned, it seems that the once popular frontal lobotomy—which as far as we know has nothing to do with endorphins—did help soothe some patients, at least to the extent that while they still felt the pain, they no longer cared about it. Much safer present-day brain operations such as cingulotomy—a small, specific interruption of a brain pathway, called the cingulum bundle, known to be involved in emotion—seem to help counteract chronic pain, although the precise reasons are not known.

The annals of pain include a few mysteries, such as that of the unfortunate handful of people who are congenitally incapable of experiencing pain. Although at first glance this may seem to be a blessing, it actually is a tragic defect, the cause of which remains elusive. Pain, after all, is a kind of message: it tells us when we've cut ourselves, or when we may be suffering a heart attack or a stroke. The absence of this crucial information source can have fatal consequences. Another phenomenon, even more bizarre, is phantom-limb pain, the strange persistence of often debilitating pain in an arm or leg that is no longer there. For reasons that are not clear, many patients with this curious condition have been helped by standard antidepressant drugs—whether or not they were depressed at the time of treatment. Coupled with evidence that among other patients depression has been known to make minor aches seem unbearable, this suggests that an intricate chemical relation may exist between physical and psychic pain.

All these factors—cultural differences, hypnosis, brain surgery, depression—reveal a top-down component of pain that is very powerful. Pain is not in any sense located at the point of injury, or for that matter in any one place in the nerves or brain. Rather, it is "located" in a highly complex interacting circuitry. Thoughts and feelings are reverberations of neural circuits, so that in the largest sense it is no mystery to find

they participate in this labyrinthine interaction. Why, after all, do studies of pain-killing drugs need a placebo control, without which they are not considered really valid? Because the administration of a pill is such a strong symbol that it alone can reduce pain for many people, even when the pill is made of sugar. Something similar can be said about the symbols used to treat pain in primitive cultures—or for that matter in modern religions. Some psychological experiments have indicated the efficacy of beliefs and symbols in affecting pain perception. For example, a patient with a sprain may imagine himself a wounded fighter pilot—or taking an opposite tack, conjure up an image of relaxing on a beach. Either approach may work for some pain sufferers.

The power of simple knowledge was once brought home to me when I had a particularly noxious stomach virus. I lay in bed for a day doubled up in a fetal position, in a feverish sweat, clutching my belly pathetically, wondering if perhaps what I had was not the typical stomach misery but some exotic illness I had carried back from Africa, or some more mundane but nonetheless deadly form of food poisoning. I was in agony until my wife called the doctor on duty at the university health services. The physician—whom I did not know—listened to my wife's description of the symptoms and said, "Yes, that's going around." The doctor's simple words, transmitted through my wife, reduced my pain drastically and almost immediately.

How does an injured quarterback sprint through his pain, or a ballerina pirouette magnificently on bloody feet? Why do wounded soldiers need less morphine than civilians recovering from similar surgical wounds? How does prepared childbirth, or the presence of a supportive friend, reduce a woman's pain in labor? The ultimate answers have to do with adaptation: we evolved in situations in which we couldn't always afford to stop and lick our wounds. But the much more complex questions about how the machinery works—and how we can learn to make it work in the anguished situations where it does not—are only beginning to be answered.

Modern pain clinics often involve psychiatrists at the beginning of the treatment plan—not just after other, physical means of treatment have failed. Pains may be purely physical in origin and still respond dramatically to psychological treatments—as !Kung laboring women could attest. Blocking pain with hypnosis or placebo is only the tip of an iceberg. Meditation, suggestion, guided imagery and a positive emotional state all help reduce pain while giving the sufferer

some sense of self-control. Formal interventions to provide external support—such as biofeedback, massage and physical therapy—can work to reduce the sense of loneliness that, along with physical tension, can exacerbate pain. Religion serves a similar function for many patients, who see in it evidence of order in the world, order that makes pain more tolerable.

For predictable pain such as that endured in childbirth, mental preparedness alone can make all the difference; it also applies to the pain of many scheduled medical interventions. And the idea of courage itself has a kind of pain-reducing power. Suppression and denial are wonderful mental strategies. We could not have evolved in the past, and we cannot survive in the future, without them. So what if we are kidding ourselves a little? Sometimes we can pretend it doesn't hurt so much, and the pretense can begin to come true.

Of course, we must not deny pain that is trying to tell us something about a serious medical condition. But frequently, after everything that can be done for that illness has been done, pain lingers. It may be an inexplicable ache for which the doctor has said, "I can't find anything wrong with you." Or it may be a chronic or recurring pain—arthritis, say, or migraine—that has produced the dreaded words, "We've done everything we can; you're just going to have to learn to live with it." Or it may be the tragic, desperate pain of advanced cancer, for which nothing hopeful can be said and the pain goes on and on. In all these very different cases judicious combinations of drugs, and in extreme cases surgery, will do a great deal to bring relief.

But such tactics alone are not the answer. Ultimately there must also be some element of will, some attempt on the part of the patient to exercise control, some decisive assertion of individual freedom in the face of a restricting, sometimes terrifying pain. And along with the relaxation techniques and the biofeedback, the physical therapy and the emotional support, the childbirth-preparation classes and the encounter-group discussions, and all the assorted tricks of the New Age, there must be something at the core—deep within the person who is feeling the hurt—that can be described only as courage. ●

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