Topical Review

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The social nature of human pain

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1. Introduction: how social is human pain?

It is still common to hear from patients and professionals that pain is a private, personal experience that only the person feeling pain can know for sure. But this does not stand up under scrutiny. Human pain is recognized to have social causes, social modulation, and social consequences. Yet pain is not defined as social, nor considered to be intrinsically social. Pain has survival value as a behavioral drive to protect the body. In humans, this engages the social elements of empathy and cooperation or exploitation. Socially integrated pain promotes individual survival and the overwhelming success of the human species.

In 2020, the IASP revised the 1979 definition of pain as follows: "Pain is an aversive sensory and emotional experience typically caused by, or resembling that caused by, actual or potential tissue injury."[25] Social aspects of pain were not included in the definition but were mentioned in several accompanying notes:

(1) Pain is always a subjective experience that is influenced to varying degrees by biological, psychological, and social factors

(5) Although pain usually serves an adaptive role, it may have adverse effects on function and social and psychological well-being.

Before the release of this new definition, several alternatives were proposed, including "a distressing experience associated with actual or potential tissue damage with sensory, emotional, cognitive, and social components"[34] and "a mutually recognizable somatic experience that reflects a person's apprehension of threat to their bodily or existential integrity."[6] Despite "considerable discussion centered on whether to include the social aspects of pain in the definition," social aspects were deemed "not an essential component."[25,32]

1.1. Social causes of chronic pain

Chronic pain has social and biomedical and psychological causes. A recent systematic review[16] described the better prediction of low back pain (as for many chronic conditions[9,27]) by social determinants than by clinical care, even in countries with universal access to health care. In clinical implementation of the biopsychosocial model of chronic pain, social factors are usually considered mainly on the individual level as modifiers of biological causes of pain,[30] but at a public health level, education attainment[4,20] and socioeconomic status[3,20,24] independently contribute to the prevalence and severity of low back pain. Previous research on the social causes of pain has focused on the effects of historical and current social context on the individual experiencing pain[8] but not from the evolutionary perspective that we advocate here.

1.2. Social modulation of chronic pain

Evidence for the social modulation of pain is broader and more rigorous than for the social causation of pain. The placebo effect is one of the most thoroughly investigated examples of social modulation of pain.[15] Through an important clinical–social ritual,[30] a pharmacologically inert substance administered to a patient in a situation where relief is desired and expected produces significant pain relief. Pain is modified by social safety signals, such as provided by parent or spouse[5,28] and exacerbated by threat signals.[18]

1.3. Social consequences of chronic pain

The social consequences of chronic pain such as work disability are well established in both developed and developing countries and appear to be increasing[26,38]; social isolation, mental health problems, and opioid misuse are also associated.[3,4]

2. Human social capacities are essential for species and individual survival

Cooperation and altruistic behavior posed a challenge for Darwin and subsequent theorists of natural selection, but modern selection theory has proposed that genes that incline the individual towards altruism to kin[10] and reciprocal altruism[24] benefit their bearers and so proliferate within populations. Some evolutionary scientists propose an alternate theory that claims that natural selection operates at the group level and on the individual level. According to this theory, human sociality emerged from groups characterized by "a complicated mix of closely calibrated altruism, cooperation, competition, domination, reciprocity, defection and deceit."[35,p73] Social interaction is widely agreed to be central in human brain evolution.[10] Some neuroscientists argue that "Instead of emerging from lower-level cognitive functions, social interaction could be the default mode via which humans communicate with their environment."[14,p182]

Our arguments for the social nature of human pain are not dependent on one theory of social evolution rather than another. Our central assertion is that social interaction is key to understanding human pain: human pain has a social nature, and this nature originated in social process. It means that pain *as it*

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functions in human groups has contributed to the success of those groups and of the species as a whole.

3. Human social response to illness, injury, and pain

Human sociality involves balancing the advantages of caring for oneself and caring for others. Humans, like all mammals and many other vertebrates, care for their infants, including attention to pain. These capacities can easily extend into care for others. Pain that arises from illness or injury is a major motivation to care for self or others. But pain may be faked or exaggerated, and this must be incorporated into a group's response to pain in one of its members. Fabrega noted that, "An ability to evaluate pain behavior and the communicative messages that are implicit in that behavior would seem to constitute a key component of the sickness-healing adaptation."[11(p62)] He described healing as "a part of the moral economy of the group and of social exchange, a component of kin-directed altruism and also altruism of unrelated individuals who expected to be reciprocated in the future for their help."[11(p85)]

Pain was not originally a medical problem for early human groups because there were no dedicated medical experts. Rather, pain was a survival problem for the individual and the interdependent group members. Individuals unable to perform their usual roles could be a risk to the survival of the group. Interpreting and addressing pain was an important role and driver of human social capability: "The perfecting of quick and expert reading of intention in others has been paramount in the evolution of human social behavior."[35,(p56)] This reading of the intentions of others involves the assessment of ability vs inability and therefore cooperation vs deception. All of these involve the display of pain by injured persons and its assessment by others.

A specific cognitive mechanism, "cheater detection," has been proposed as central to human sociality and cognition, rather than a subordinate skill that evolved from a general cognitive capacity.[7] In the modern era, we are accustomed to pain being investigated by medical technologies such as imaging and the physical examination. But these specialized technologies appeared much later than a general social strategy of deciding who genuinely needed help and who did not: "cheater detection." "A cheater is an individual who fails to reciprocate—who accepts the benefit specified by a social contract without satisfying the requirement that provision of that benefit was made contingent on."[6(p591)] Children understand what constitutes cheating on a social contract by age 3 years. The importance of cheater detection in social exchange goes beyond the problem of pain, but as an invisible disabling problem, pain is a prime driver of the need for responding to cheats by withdrawal of care. Cheater detection is essential to the success of groups, who are otherwise overwhelmed by those who benefit from help but do not reciprocate. Humans were thus "designed by natural selection to produce an evolutionarily stable strategy for conditional helping."[5, p623] The value and challenge of pain in human survival cannot be understood separate from its role in conditional helping.

4. Possible objections to the social nature of human pain

(1) Pain is a private experience

Descartes supposedly demonstrated that pain is a private and immediate experience through his "Cogito" thought experiment, which concluded that we cannot doubt that we are thinking and experiencing beings. He sought to demonstrate that we have unmediated, incorrigible contact with our subjective experience. In the 20th century, philosopher Ludwig Wittgenstein challenged Descartes with his Private Language Argument, which contended that it is not possible to communicate, remember, or know anything specific about purely private pain because these cognitive activities rely on the concepts of public language.[29,36] Wittgenstein argued that the connection between pain experience and pain behavior is not arbitrary or accidental. The public face of pain is essential to the human experience of pain. The primitive, natural expression of pain ("ouch") gives it a public face from which the language of pain can be elaborated. Pain is comprehensible and has survival advantage only through its link to (social) pain behavior.

Thus, pain concepts are an extension of natural and social pain expressions, not names for private sensations. Pain is not simply manifested in outward circumstances and expressions; these help *define* experiences as pain. We tend to define pain by properties inherent in the pain sensation (eg, aversion and location). But then, we must explain how pain is differentiated from other sensations with those properties, such as itching. In fact, we largely differentiate using expressions and behavior (eg, withdrawal vs scratching).

One notable objection to the social nature of pain asks: can a person alone on a desert island not experience pain?[32] We reply that the pain experience of a stranded adult is shaped by earlier social influences (language, concepts, habits, expectations). We argue that human pain should be defined as social because pain is an essential part of the human social capacities that enabled our remarkable success as a species. We contend that both chronic and acute pain are social, although we focus mainly on chronic pain.

(2) Pain is defined by its links with tissue damage and nociception

Both the 1979 and 2020 IASP definitions of pain retain references to tissue damage, albeit qualified.[25] But it is not clear that tissue damage or nociception are necessary for nociplastic pain: "Pain that arises from altered nociception despite no clear evidence of actual or threatened tissue damage causing the activation of peripheral nociceptors or evidence for disease or lesion of the somatosensory system causing the pain."[20] Evidence is lacking that nociception plays a causal role in fibromyalgia or many other nociplastic pain states.[12] For this, perhaps uniquely human, form of generalized pain, social threat may be more important than tissue damage.[23] Newer theories of central sensitization do not require nociception to establish enhanced pain sensitivity.[37] Thus, nociception should not be placed at the center of our pain models as it has been in the Loeser "onion diagram" of pain concepts.[11]

(3) Empathy is a poor foundation for human morality and sociality

One argument for the social nature of pain is that empathy for pain is natural and spontaneous, even among nonprimate mammals.[21,22] However, Bloom has argued that empathy is short lived and short sighted and leads to self-serving behavior, not true altruism or legitimate morality,[2] so empathy has serious shortcomings as a guide for human decision making. We agree that empathy may not be a sufficient foundation for human morality but that it is a necessary one. It is how we initially connect with the suffering of others. Although rodent empathy is likely limited to emotional contagion, human empathy occurs in a more complex cognitive and social context. It has been called "adaptive empathy," which includes social feedback following empathic responses, and is more closely related to "cognitive empathy" (sometimes called "mind-reading").[17] Being able to read others' responses can also be used to deliberately inflict suffering and pain, on others, for multiple reasons.[19]

(4) Fordyce's operant analysis of pain behavior is a more concrete and clinically applicable approach to the social nature of human pain

In 1988, Fordyce observed that "pain behaviors are interesting social communications, the meanings of which remain to be discovered in the individual case."[13] He meant that pain reports were not simply informational reports concerning private mental states but that they had social purposes and effects and were shaped by the social context in which they were uttered. Pain behaviors were understood as behaviors that functioned in a social environment. However, such social communication is not necessarily intentional: onlookers can generally "read" behavior indicating pain, even when the person in pain attempts to suppress it. These insights have played a crucial role in understanding and treating the disability, ie, an important consequence of chronic pain.

It is not immediately clear how the evolutionary analysis of pain that we provide here will have such practical and useful implications: it is an ultimate explanation, whereas Fordyce provides proximal explanations for behaviors. Both address the advantages that pain provides, but Fordyce does so for (1) at the individual rather than the species level, (2) with social rather than survival benefits, and (3) through a behavioral rather than experiential process.

Throughout his career, Fordyce differentiated pain (as a bodily signal) from suffering (as a personal response). In this respect, he did not go as far as Patrick Wall, who understood both pain and suffering as responses of the organism to a hostile environment,[33] an evolutionary perspective that anticipates ours.

5. Conclusions and the path forward

We have argued that human pain is intrinsically and essentially social because pain and pain evaluation are deeply woven into the human social capacities that have been key to our evolutionary success. Human brains evolved to evaluate bodily damage in a broader context of threats to survival. This context includes empathy, cooperation, and competition, including cheater detection. Even experiencing our own pain is affected by our social context, which provides the threat/safety setting within which events that start inside or outside the body are experienced as pain or not. Recognizing that human pain is intrinsically social helps to rebalance the biopsychosocial model of pain, adding interpersonal features to physiological mechanisms and giving them more prominence. Social factors, such as perceived injustice, can now be allowed to stand as independent and primary causes of pain.[31] Social interventions, like supported return to work programs, may now be recognized as addressing the "real causes" of pain.[1]

Recognition of the evolutionary roots and advantages of social pain can facilitate further research. We might ask, how does pain function socially in modern hunter-gatherer groups? How is pain validation accomplished in these groups, and how does it differ from more modern human groups and social mammals? We might also ask, how does the social nature of nociceptive, neuropathic, and nociplastic chronic pain differ? How are we to understand the evolutionary roots of chronic pain resulting from physical trauma vs social trauma? The social nature of pain can also be explored in laboratory research. Is the "mind reading" thought to be at the root of human empathy better understood as motor mirroring or as "mentalizing" where we attribute mental states to others? Can we adequately investigate social aspects of pain by imaging one brain at a time, assuming that stimulus–response effects are unidirectional? Or must we image 2 brains simultaneously, looking for bidirectional effects?[14]

Pain has an evolutionary history that helps us understand its survival value. For humans, this evolutionary history is centered around our powerful social capacities. Because these social capacities involve evaluating and responding to pain, we argue that human pain has an essentially social nature.

Conflict of interest statement

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