

Editorial

Delineating the Hurtful, Engaging, Emotive, and Directive (HEED) Dimensions of Pain. Characterization for Clinical Relevance

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Pain is an objective, natural reality among sentient creatures that possess cognition and mobility sufficient for apprehending and acting upon its full significance. Defining pain mostly in mental terms makes sense for self-conscious psychology and vocabulary. Pain as a natural capacity among animals did not evolve merely to be aligned with human semantics and intuitions. Much about pain operates beneath the level of accessible and explicit consciousness, and pain as a sensory feeling probably arose before mammalian cognition. Pain should not be viewed as just a simple sensation of utter subjectivity. It displays qualitative variance, degrees of intensity, fluctuating durations, and deflects and/or captures attention. These features of pain situate it prominently within awareness amidst the myriad physical feelings and emotions that influence behavior. The significance of pain cannot omit felt painfulness, and pain wouldn't be painful without its urgent significance for redirecting bodily activity. Most pain shares characteristics of being hurtful, engaging, emotive, and directive (i.e., HEED). So delineated, pain evolved to be HEED-ed. Our proposed operational delimitation at first glance appears to be physiological, but its reliance upon the bio-psychosocial actuality of the painient organism renders it inter-theoretically reducible and expandable. This delineation of pain necessitates its being HEED-ed by the organism in which it occurs; and hence ethically heeded by those who profess to study and treat it.

Key words: Pain, neuroethics, phenomenology, philosophy of mind, hurt, subjectivity, objectivity, classification

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In this second of our multi-part series of essays, we take up the pursuit of pain as a kind of naturally evolved system, no less complex than an immunological or endocrine system, which maintains a unity towards its multi-faceted utility. Pain is part of the human condition as vulnerable beings, as organisms that inherited our animal nature, and certainly humans are not the only beings experiencing pain on this planet (1). Defining pain quite subjectively and anthropomorphically may seem right to us humans, but treating pain as a human specialty puts blinders on investigations of pain's evolutionary function. In this essay, we postulate that the natural reality of pain allows for a refined formulation of an iterative and comprehensive neuroethics of pain research and care.

Postulating Pain

The evolved dimensionalities of pain are only somewhat accessible to human self-consciousness. Deductions from semantics and intuitions, or inductions from exemplars and analogies can only reveal limited aspects of what humans know as pain. Marshalling bodies of evidence to bring credibility to postulations about natural pain across the animal world must fall to abduction. Postulating pain involves abductive inference, a method of reasoning to compare competing hypotheses to evaluate their continued viability against ever more inventive experimental testing (2). No postulate

can – nor should – assume credibility while rival hypotheses and theories look less intuitive or novel experiments haven't materialized. Abduction, unlike induction, postulates that collecting conformable and favorable evidence should be more, and not less, scrutinously questioned. A simple account, as listed in A–C below, appears sensible at face value, but is logically suspect:

- A. If an organism feels pain, its activity (inclusive of neurological network patterns, which are observable for example via certain forms of neuroimaging) would look like they are experiencing pain.
- B. Human experimenters can elicit behaviors and neurophysiological activations that make organisms “look” like they are experiencing pain.
- C. Therefore, it is likely that such reactions (inclusive of patterns of neurological activity) are evidence of pain experiences.

This is an abductive argument, but in its cruder, anthropocentric form. Abduction has been called Inference to the Best Explanation (3). Accepting a postulate before either experimentally confirming conditions or considering alternative explanations falls short of an inference to “the best” explanation. The above argument's conclusion (C) about pain actually amounts to a guess, which we propose should be regarded as an Inference to a Bet Explanation. For it is just a bet, a postulate, and remains a hypothetical gamble. Furthermore, it is a gamble that presents serious clinical and moral implications, which can be likened to a sort of Pascal's wager (4), predicated upon precautions against a worst-case outcome. This sort of “Bet” explanation can appear sensible and sensitive enough, making it seem unreasonable to deny the possibility of pain. All the same, there's no lack of imagination in the skeptic, who is instead asking for a reasonable standard for abductive evidence greater than “the imagined postulate might actually be occurring.” Indeed, pain might be occurring; but many physiological events might cause a certain pattern of neurological activity, and different species vary significantly in their neurophysiology for displaying diverse behaviors.

If the worst outcome is to permit, or be complicit with, the cause of unwarranted pain in a vulnerable patient or painient animal, perhaps the standard of evidence should be lowered in light of the ethical stakes. When ethics is driving the intuitive force for a stretched inductive analogy, one is additionally faced with an argument, one could say, an inference towards a “Blessed” explanation.

The problem of pain is worthy of both iterative scientific investigation, and ongoing moral attention. Researchers looking for the best explanation need to rely on the best science, available from multiple relevant scientific fields (5). Pain's status as a natural event should not be left to the material or moral imagination in those situations and circumstances where risky inductive analogies flourish. But then where lies the securely scientific, abductive path ahead? Perhaps pain is basically biological, no matter whether an organism notices it. Or, perhaps pain stays essentially mental, of material importance regardless of what physiological processes are occurring. After all, humans have intimately known pain long before knowing about the nervous system. Physiology and psychology can at least agree about the philosophical double-entry known as psycho-physical parallelism, which regards mental and bodily events to be perfectly coordinated without causal interaction between them. However, we argue that it doesn't take much philosophy to question whether such parallelism can do justice to pain. The word “pain” is employed in both neurophysiology and psychology, but often without the same meaning. One sort of pain couldn't universally explain the other with these sorts of rigid magisteria in place.

If pain were as subjective as philosophers portray it, no amount of neurological knowledge could account for anything about pain. But this begs the (rhetorical) question: Are nervous systems really that irrelevant to understanding pain? The logical answer is, of course not. Philosophy deserves its notorious reputation for devising “hard problems” that are rife with categorical mystifications. Feelings are embodied and embedded in lived situations. Does pain feel immaterial? Again, of course not; many phenomena of lived experience can be ephemeral and insignificant, but pain is not among them. We posit that one way to dissolve philosophically “hard” problems is to reject any categorical presumptions that have not been compared to empirical and experimental realities. Neurological research deals in observable evidence, scientific classifications, and correlative, if not tentatively causal explanations. The only thing about subjectivity that genuinely emerges from so much neural activity (in the healthily functioning individual) is a perpetual sensitivity to its internal state, and a constant relationality to externality (6, 7). No organism has any subjective experience (inclusive of imagination) that is not oriented to the objective, retrospective, and prospective. The phenomenological domain is a nexus between interiority and exteriority;

it is, as neuroscientist Antonio Damasio well states, the “feeling(s) of what happens” both inside and out (8).

Pain as an Evolving Capacity

Depicting pain as merely a simple stimulus, or as a complex behavioral adjustment, obscure the ultimate “point” of painfulness. Neither reducible to synaptic activity nor to mental sensitivity, pain exists naturally, both physiologically and psychologically, as its own entity and with identity without evident duality. A common view takes pain to naturally refer to a type of simple sensation among basic feelings. Yet, pain displays qualitative variance, degrees of intensity, fluctuating durations, and deflects and/or captures attention (9). These features situate pain prominently within awareness amidst the currents of feelings and emotions that influence behavior.

Pain has historically been taken to be essential to sentience; with one surely implying the other (10). Such deductive confidence has eroded. Respect for sentience ensures that experience matters, as an organism acquires behavioral modifications in response to patterned encounters with the world. Sensible learning, beyond that of mere sensory association, is a cognitive characteristic of complex metazoans, and inductively the apportionment of creatures that are currently regarded as sentient has become greater. But that pliability of sentience means that basic stimuli and simple sensitivity need not include pain. Abductively, there are alternatives for situating relationships among nerves, sensations, qualia, and awareness, which might be useful when considering the possibility and probability for the occurrence of pain. We propose that a preliminary list, in order of increasing cognitive complexity, would look like this:

- Synaptic simplicity with minimal sensing without awareness for any feelings. Reactive motility and no pain.
- Nerve nets/ganglia and simple sensitivity without awareness for any feelings. Reflexivity and limited responsivity, but no pain.
- Nerve systems/minimal brains and qualitative sensing without awareness for any feelings. Acquired or conditioned responsivity to stimuli, but no pain.
- CNS-brains and qualitative sensation with aware feelings but no hurting. Alert adjustments to activity from noxious stimuli, but no pain.
- CNS-brains and qualitative perception, aware feelings, and pain-as-hurting. Sophisticated behaviors to mitigate pain.

Further discriminations among these five levels are surely important for fields studying animal behavior, the evolution of cognition, and neurophysiology. We emphasize again how the abductive approach necessitates multiple scientific fields to be coordinated in appreciating a natural reality to pain. Here, this five-fold staging only shows how the complexities of the phenomena of pain should be consistent with complex cognitive capabilities. No disparagement of simpler organisms is intended. Organized awareness was a significant cognitive achievement in itself, as brains forged coherent streams of animating perceptions towards refined motor control. With the gradual emergence of awareness, motivating feelings such as fear, anger, and pain were not automatically present in arthropods, mollusks, or early chordates (to mention a few phyla). To date, controlled conditioning studies of lobsters and fish are supportive of their capability to process and react to noxious stimuli (11), while brain architectures and dynamic behaviors of cephalopods (viz.- octopus) may indicate the pain attentiveness common to tetrapods (12).

What looks or feels painful to primate consciousness needn't be so significant to just any animals with nervous systems adequate for withdrawal and grooming responses. Bentham famously urged concern for creatures that are vulnerable to pain (13). Sentience is indeed required for pain, but not the reverse; an animal's sentience does not guarantee a pain capacity. Evolutionary distribution of basal sentience was greater than its allotment of pain, or higher order consciousness. Definitions of sentience and consciousness may remain contested, but investigations of pain's nature needn't be delayed in the event. Absent sufficient evolutionary reason and/or value, pain would not exist if and where simpler reactions would suffice. Pain is especially meaningful and memorable to the organism in which it occurs. Plainly put, the significance of pain cannot omit felt painfulness; and pain wouldn't be painful without its urgent significance for redirecting bodily activity.

A New Operational Term: PAIN is to be HEEDed

Apart from debates over the nature of sentience and/or consciousness, preliminary reflections about the importance of pain indicate an objective core contributed by evolution. Accordingly, we propose an operational delineation for natural pain as distinctively qualitative in awareness, distractive to attention, affec-

tive for motor control, and effective with behavioral shifts. In brief, most pain shares how it is hurtful, engaging, emotive, and directive (i.e. what we refer to as HEED factors). Hence, thus delineated, pain evolved to be HEED-ed.

This delineation of key co-factors is not a general definition of pain in and for all contexts and situations. Rather, this operational delineation, which we have denoted as PAIN (vs. "pain"), only selects factors naturally contributing to animal pain. Pain as humans prefer to conceive of it cannot be precisely and categorically defined; nothing necessarily or even sufficiently identifies everything regarded as pain across all cultures (14, 15). In contrast, an operational delineation only selects core conditions of mutual dependency. Thus, with PAIN, hurtfulness is bound to its emotive directivity, and that affectivity for behavior is bound to its distracting attention. We opine that the obvious circularity of including pain's distinctive quality is an operational merit, not a categorical fallacy. Omitting painfulness would doom any authentic account of pain by depriving it of its experiential reality.

PAIN as HEED is about what pain does to the sufferer, and how pain does it. This operational delimitation does not assert that pains are just anything hurtful that are engaging, emotive, and directive. The hurt of grief is indubitably engaging, emotive, and directive for human beings. Nevertheless, grief is not a counter-example to an operational delimitation for natural PAIN, even if grief seems subjectively painful in some manner. Rather, the way that PAIN operates for organisms, and not just humans, includes the four factors of being hurtful, engaging, emotive, and directive. Other sensory states like PAIN are doubtlessly similar. Various sorts of feelings (e.g. itch, chill) with their own distinctive qualities, approach such criteria. But what differentiates PAIN is that it is significantly hurtful. The hurtfulness of pain is ill-suited to confusion with other feelings. In other words, if it's hard to tell whether a sensation is pain, it isn't painful. Pain can accompany other feelings and even seem to blend with them; but in such situations the four HEED factors are still satisfied. Therefore, for any sentient animal, pain can never be about just two or three of these four features; it obtains and entails all four, all of the time, at least to some extent.

PAIN combines physiological, neurological, psychological and phenomenological aspects for empirical delimitation. Is that combination a theoretical weakness? We think not. Clinical medical clarifications display such

combinations, such as the IASP definition: "An unpleasant sensory and emotional experience associated with, or resembling that associated with, actual or potential tissue damage" (16). Multiple factors would be expected with any adequate conception of painfulness, whether on a human or non-human basis; and over-weighting of one or another factor should be avoided.

Toward A Neuroethics for Heeding Pain

In sum, human brains did not evolve to easily dismiss pain. Pain evolved, and it evolved for humans' tetrapod ancestors, if not earlier. At first glance, our proposed operational delimitation of PAIN appears to be physiological, but its reliance upon the biopsychosocial actuality of the painient organism renders it inter-theoretically reducible and expandable. This delineation of PAIN necessitates its being HEED-ed by the organism in which it occurs, and in this light, to be ethically heeded by those who profess to study and treat it. That being the case, what might these alternatives infer or mean for regarding and treating pain in different kinds of individuals? Researchers are certainly curious about the nature and treatment of pain in en-brained animals (17), but explorations of what pain is, and how it is experienced and manifested take on additional gravitas when considering human pre-nates and neonates, and those individuals who are neurologically injured/diseased, obtunded; minimally aware, and/or in vegetative states (18).

Physiologically, PAIN as HEED need not be yoked to mechanistic or micro-level accounts of anatomical damage (even if no pains would exist without it). Objective instances of PAIN should be validable apart from determinations of where neural insult or functional aberrations are identifiable, so that correlations worth closer investigation can be established. This is particularly salient for investigating pain in those situations in which neural structures are divergent and/or differ – for example, during ontogenic development; as consequential to individual variation; due to insult/injury or disease; after an intervention; and so on.

The field of neuroethics – as an interdisciplinary effort – is tasked with examining the implications of the brain sciences (for persons and society), as well as establishing ethical responsibilities attendant to neuroscientific research and its translation in medicine, and other domains of human ecology. Searching for the neurological bases of qualitative feeling and higher modes of sentience applies scientific expertise to ethical enterprise supportive of a precautionary principle

to protect (unanesthetized) painient beings. Such a precautionary duty is valid if and when all available evidence has undergone sufficient scientific scrutiny to ground ethics to extant fact(s). Inclusive of the fact(s) of pain (as pain, PAIN and that which is to be HEED-ed).

Our subsequent essay addresses how this operational delineation of PAIN compels research and therapeutics within an extant construct of the philosophy of medicine, as applicable to research, clinical care, and the guidance of health policy.

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