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Pain as a threat to the social self: a motivational account

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1. Introduction

It has been proposed that the definition of pain ideally recognizes not only sensory, cognitive, and emotional dimensions, but also a *social* dimension [110]. Although it is widely acknowledged that interpersonal context modulates pain experience and communication [39,56], we still fail to understand why and how this modulation occurs. Drawing from evolutionary, social, and health psychology, we argue that pain is a fundamentally social and threatening human experience because it challenges several basic needs (see Fig. 1): (1) the need for autonomy, (2) the need to belong, and (3) the need for justice/fairness. Examining how pain interferes with these basic human needs can help us better understand the dynamic interplay between social context and pain. Here, we (1) define these fundamental human needs, (2) outline how pain threatens these needs, and (3) describe the consequences of such threats, especially for pain itself.

2. The need for autonomy

Even though humans are an inherently social species, they possess a fundamental need for autonomy and a *sense of agency*, a subjective feeling of control over their own actions and their outcomes [13]. To predict and control the environment is at the center of survival fitness, especially in the case of aversive experiences like pain [17,18,100]. We argue that in the context of pain (and illness), the need for autonomy has a fundamentally interpersonal connotation because agency shifts from the person with pain to others.

From an evolutionary perspective, pain can be conceptualized as a homeostatic emotion [16] or an "awareness of a need state" that is communicated to conspecifics [109]. In contrast to more solitary animal species, humans evolved as a reciprocally altruistic species, prioritizing the ability to communicate need states to elicit help from or warn others. This may help to allow survival in otherwise fatal situations [31]. Illness symptoms in general can have

a signaling function [94] and the same is true for facial pain expression [108]. Therefore, a state of illness in general and pain in particular can place humans into a state of dependency on others.

Feelings of helplessness and uncontrollability are common when suffering from pain, especially when it is chronic [83]. Moreover, Western society emphasizes individual function and autonomy, which is severely hampered by chronic illness. Consequently, many people with chronic pain experience shame, embarrassment, and humiliation [88]. These emotions are often fueled by interpersonal worries such as being a burden or whether pain is taken seriously [97]. Last, pain can be the result of victimization at the hand of others, such as in the cases of torture, bullying, or physical assault [3,101]. In the latter, the difference in power and control is paramount, as it places the victim at the mercy of a hostile assailant.

Feelings of uncontrollability and helplessness have adverse effects on physical and psychological health and pain. The debilitating consequences of uncontrollable events have been shown across different species and led to the "learned helplessness hypothesis" of depression [1]. Regarding pain, experimental research has demonstrated that predictability and controllability of pain are major determinants of cognitive pain processing [12,68,70,83,105]. Uncontrollable pain stimuli are perceived as more intense, harmful, and unpleasant than controllable ones [12,61], and subjective feelings of helplessness have been associated with increased pain intensity [69]. Losing control over pain is even worse than never having had control over pain in the first place [17]. Also, feelings of helplessness [83], and shame, guilt, and fear of negative evaluation predict pain intensity levels [97]. Although this research does not emphasize uncontrollability and helplessness in a social domain, pain places the individual in a state where s/he relies on others for support, transferring control to others such as family, friends, and most importantly, healthcare providers. Additionally, doctor-patient relationships are often characterized by authoritarian and paternalistic

physicians and problematic treatment compliance, and many people with chronic pain are dissatisfied with their care [47].

In the case of victimization, consequences are even direr. Victims of bullying are at increased risk of developing chronic pain complaints [30,99,101] and the same is true for victims of torture [3,11], and interpersonal abuse [6]. Pain intentionally inflicted by others is perceived as more intense than incidental pain [37] and is associated with reduced pain communication [51,74,108].

3. The need to belong

Humans as social animals have a pervasive drive to form and maintain at least some lasting, positive, and significant interpersonal relationships [7]. This motivation has been demonstrated across cultures, affects a broad variety of behaviors and leads to serious adverse effects when thwarted [41,111].

Pain threatens the need to belong in numerous ways. First, pain interferes with social activities such as work and hobbies [35]. People with chronic pain experience stigmatization and invalidation (i.e., ignoring, rejecting, or negatively evaluating one's thoughts or feelings) [14,44,78,103,104,107], especially when medical pathology is not confirmed [22,79,80,82]. People in pain are judged as less warm and less competent by pain-free individuals: effectively, a derogated out-group [5]. More broadly, chronic pain conflicts with societal norms that emphasize health, autonomy and functionality until old age and the dominant norm that pain should be short-lived, diagnostically meaningful, and denote a fixable problem [23,73,110].

Individuals with chronic pain are more socially isolated and excluded than healthy controls across the lifespan [33,71,75], especially when pain has no medical explanation [77]. While it has been argued that one of the 'key objects of fear' in chronic pain is threat to self-

identity [65], this threat also directly affects the 'social self' [88]. Individuals with chronic pain internalize stigma regarding alienation and discrimination [104]. The link between illness and social isolation is supported by evolutionary theories. Ostracism of ill members has been observed in most social species and across time and culture, increasing group cohesiveness for those not ostracized and enhancing fitness for survival [38,112], for instance by limiting the spread of infectious diseases [87].

Thwarting the need to belong has a host of detrimental consequences for physical and psychological health and for pain. Chronic deprivation of the sense of belonging has been associated with increased stress levels, reduced immune functioning, and increased mortality. Similarly, loneliness is strongly associated with increased risk for morbidity and mortality [2,7,41]. In regard to pain, social exclusion is associated with increased pain reports and vice versa [8,28,112]. Social stress and pain also share overlapping neural pathways, often interpreted as evidence that the human pain detection system has been coopted to detect and react to social threat [26,27,29,53,72]. Social exclusion has been associated with increased [8] but also decreased [20] pain reports. Pain tolerance is positively related to social network size [45], and perceived social isolation in individuals with low-back pain predicts future disability [46,71]. In rheumatoid arthritis pain, perceived stigmatization is related to poorer physical and psychological well-being. Importantly, perceptions of social isolation and stigmatization seem to be more important than actual size of the social network [55,78].

4. The need for justice / fairness

Humans have a universal investment in justice and fairness [10]. Justice and fairness have been of interest for hundreds of years in philosophy, economy, law, and increasingly, psychology [63]. The literature commonly distinguishes between *outcome fairness/justice*, which refers to equality/fairness in outcome and *procedural fairness/justice,* which refers to equality/fairness in the procedure leading to a certain outcome. A preference for fairness and

justice has been demonstrated in humans but also in other species including apes, monkeys, dogs, and birds, providing evidence for an evolutionary basis, a mechanism for payoff evaluation in species that cooperate with others and rely on reciprocal altruism (e.g., tit-for-tat) [9,10,93]. In pain, perceived injustice has been conceptualized as a set of cognitions comprising attributions of blame, magnitude of loss, and irreparability of loss [89].

Perceptions of injustice are both common and detrimental in pain sufferers [89,91], especially when injury or pain can be blamed on someone else's actions or negligence (e.g., a car accident) and when pain is perceived as unnecessary. In such cases, responsibility is attributed by the person with pain to someone else: attribution of blame and responsibility are key processes in making sense of chronic pain [24]. In the case of stigmatization and invalidation of individuals seeking care for persistent pain, it is often assumed that the person with pain has a vested interest in exaggerating or even fabricating pain and other symptoms [80,82,107]. Perceptions of unfair behavior by the person in pain can directly lead to pain underestimation in observers [48,49], and this is particularly marked where medical causes are absent, leading to suspicions of malingering [49]. Overall, perceptions of injustice often arise from the behavior of close others such as colleagues, family, and health-care providers, particularly where the person with pain believes that those others contributed to the injury, inadequately assessed or treated pain, or responded punitively to expression of pain [85]. Some research has also highlighted the importance of "just world" beliefs in perceptions of injustice: a belief that the "environment is a just and orderly place where people usually get what they deserve" (p. 1030) [58]. Pain, especially when chronic, fundamentally challenges this belief, and blame functions to restore just world beliefs. Furthermore, injustice is not merely "perceived" by individuals suffering from pain, but there are a range of systemic and societal injustices in the assessment and treatment of pain based on gender [84], race [21,25,43], ethnicity [66], age [42], and other characteristics of the person in pain. Perceptions

of injustice also play a crucial role in the violations of the needs discussed previously. Experiences of exclusion are often associated with perceptions of injustice [112] and so are experiences of helplessness and uncontrollability, especially when others take advantage of such a situation [36,37,74].

Violations of justice and fairness have a range of detrimental consequences, often categorized as *reactions of withdrawal* and *reactions of attack* [63]. Reactions of withdrawal involve exclusion and discontinuation of prior cooperation; reactions of attack include feelings of anger and retributive behavior that is intended to punish the offender [9]. This set of responses is observed in human and non-human animals and is evolutionarily adaptive, as it promotes future cooperation and deters cheaters and freeloaders. In animals, violations of justice might be met with temporary social exclusion and discontinuation of cooperative relationships as well as displays of anger [10]. In humans, discontinued cooperation can take the form of not complying with authority that is perceived as unjust. Moreover, the link between injustice and anger is well established [62], and perceptions of injustice might be the single greatest cause for feelings of anger, retribution and aggression [4,52,63]. According to the social interaction theory of aggression, the primary function of aggression is to produce some change in others' behavior (e.g., to exact retributive justice for perceived wrongs). Similarly, social exclusion frequently leads to aggression and punishment when it is perceived as unjustified [98,102] and punishment for injustice often occurs even at the cost to the punisher [9].

In pain, perceptions of injustice have been associated with increased pain intensity and unpleasantness [60,95]. In individuals with chronic pain, perceptions of injustice have been associated with a range of problematic outcomes [91], including prolonged work disability and impaired physical functioning [89], increased pain catastrophizing, persistence of post-traumatic stress symptoms [92], heightened protective pain behavior [90], and anger [59].

Anger itself has also been associated with increased pain reports and decreased pain tolerance [96], disability and treatment non-adherence [86,91] and interpersonal consequences, such as social exclusion and reduced social support [32]. Moreover, if the person in pain is perceived as someone who is deceptive and unfairly tries to gain an advantage (e.g., care or financial compensation), this may result in invalidation, stigmatization, pain underestimation, and negative evaluation of the person with pain [48,49,80,81].

5. Future directions

Pain is an inherently social experience and threatens our social needs in three fundamental ways: (1) it shifts control away from the person with pain to others, (2) it excludes, and (3) it is often associated with (perceived) injustice. This framework has direct clinical implications, since social needs are often considered secondary to physical health-related needs. While specific recommendations are premature, the recognition that pain directly affects the social self may help clinicians to better customize their interventions to the needs of those seeking help. This awareness also highlights the responsibility of the healthcare professional not only to meet an individual's pain-related needs, but also to address interpersonal needs, most effectively achieved with a multidisciplinary effort [107]. Specifically, clinical practice should involve (1) standard assessment of interpersonal needs and motivations, (2) recognition of threats to these needs, and (3) attempt to resolve thwarted needs as far as possible, and facilitates active involvement of the social network such as family members. Crucially, considering that threats to these needs also frequently originate on a systematic and societal level, interventions should target these levels as well [78,107]. Critically, the relationship between social needs and pain is *bidirectional*: Pain does thwarts social needs but thwarted social needs also have detrimental consequences for health *and* pain (e.g., by affecting the perceived harmfulness of pain [56]). Psychological experiences,

including pain, are powerfully shaped by social context [34,40,67]. Thus, managing social context *is* managing pain.

This framework also generates several paths for further empirical investigation. *First*, there is a need to accurately assess interpersonal needs and motivations within pain research. Assessment methods for these could be borrowed from other fields where available (e.g., [7,112]), or developed from first principles. We have a wide variety of instruments available to assess pain-management motivations, but other motivations (especially interpersonal motivations) are rarely assessed [50]. *Second*, and in line with recent motivational accounts of pain [18,19,106], we need to better understand how pain-related goals and motivations compete or interact with concurrent goals, social or otherwise, and how they affect (pain) behavior [15,39]. It is relevant to know when and how an individual prioritizes certain pain-related goals over others. *Third*, the expansion and integration of different disciplines, levels of analyses, and populations could substantially advance understanding. Specifically, the evolutionary framework underlying this work emphasizes the importance of translating and integrating research findings from different species and disciplines, and to identify universal mechanisms by which social needs affect behavior, and variants [57,64,109]. Similarly, while most empirical research focuses on the individual level (up to small groups), the phenomena highlighted in the present account originate from, or are influenced by, the macro-level as well (e.g., the health-care system, societal and cultural norms) [107]. Several existing lines of research such as gender and sex differences in pain [54], perceptions of injustice [91], or stigma and invalidation [78] would profit from a macro-approach. *Fourth,* there are several other ways by which pain can threaten interpersonal human needs (e.g., challenging the self-concept [76]) which are beyond the scope of this review but deserve further scrutiny.

In sum, dissemination of the biopsychosocial model of pain to health-care professionals, patients, scientists and the general public is crucial to understand that meeting the interpersonal needs of an individual with pain is fundamentally associated with increased physical and psychological well-being of the individual in general, and their experience of pain in particular.

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Figure legend

Figure 1: A schematic representation of the three fundamental interpersonal needs at the nexus of an individuals' pain experience. Pain threatens these needs in a myriad of ways but is in turn affected by thwarted needs as well. Note that pain in this context refers to both pain appraisals (e.g., pain intensity and unpleasantness), but also pain behavior (e.g., pain expression, disability, treatment adherence). Different needs may overlap and influence each other (e.g., an experience of ostracism may be excluding but at the same time lead to perceptions of injustice and helplessness). While these needs are private to the individual (level 1), they are inherently influenced by the social context, be it the interpersonal context (level 2, i.e., partner, family, health-care professionals) or the socio-cultural context (level 3, i.e., groups, culture, social norms). Conversely, thwarted interpersonal needs can affect the relationship between the individual and the social context as well (e.g., withdrawal from social circles or attack in the form of antisocial behavior). Lastly, individual factors (e.g., personality traits) might function as a buffer or facilitator for the flow between these different levels.