



WHAT IS THIS PAIN THAT I FEEL? ON THE IMPORTANCE OF THE NOCICEPTIVE SYSTEM FOR THE INTEROCEPTIVE EXPERIENCE OF PAIN *

O que é essa Dor que eu Sinto? Sobre a Importância do Sistema Nociceptivo para a Experiência Interoceptiva da dor

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Abstract: Although the multidimensional nature of pain experience is acknowledged by many researchers, the relationships among dimensions are not always clarified. An important issue concerns the relationship between the nociceptive system, which is part of the peripheral nervous system, and the interoceptive experience of pain, which is encroached by cognitive and emotional processes. Some researchers in the neurosciences, and in philosophy, hold what we will refer to as the “dispensability view”: that the nociceptive system is contingent on the experience of pain. Accordingly, nociceptive activation is sufficient, but not necessary to pain experience. At first glance, this view seems suitable for explaining pain cases that are difficult to diagnose, such as certain types of chronic pain and phantom limb pain. However, the view is that it fails to address two *desiderata* of pain theories: first, a conceptual issue, consists of the difficulty experienced by chronic pain patients in reporting their own pain. Second, an empirical issue, relates to recent research relating chronic pain to problems in pain signal processing due to a hypersensitivity of the nociceptive system that overburden the interoception. These two *desiderata* are closely connected: the hypersensitivity of the nociceptive system overloads interoception, thereby exceeding the descriptive capabilities of patients. Thus, we will argue that for a

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theory of pain to meet these *desiderata*, it must commit to the indispensability of the nociceptive system.

Keywords: Pain. Nociception. Philosophy of pain. Philosophy of mind.

Resumo: Embora a natureza multidimensional da experiência da dor seja reconhecida por muitos pesquisadores, as relações entre as dimensões nem sempre são esclarecidas. Uma questão importante diz respeito à relação entre o sistema nociceptivo, que faz parte do sistema nervoso periférico, e a experiência interoceptiva da dor, que é invadida por processos cognitivos e emocionais. Alguns pesquisadores em neurociência, bem como em filosofia, defendem o que chamaremos de “tese da dispensabilidade”: que o sistema nociceptivo é contingente à experiência da dor. Consequentemente, a ativação nociceptiva é suficiente, mas não necessária para a experiência da dor. À primeira vista, essa visão pode explicar casos difíceis de diagnosticar, como certos tipos de dor crônica e dor de membro fantasma. No entanto, o problema com essa visão é que ela não aborda dois desideratos das teorias da dor: primeiro, uma questão conceitual, consiste na dificuldade experimentada por pacientes com dor crônica em relatar sua própria dor. Segundo, uma questão empírica, relacionada a pesquisas recentes que relacionam dor crônica a problemas no processamento do sinal de dor devido a uma hipersensibilidade do sistema nociceptivo que sobrecarrega a interocepção. Esses dois *desiderata* estão intimamente conectados: a hipersensibilidade do sistema nociceptivo sobrecarrega a interocepção, excedendo assim as capacidades descritivas dos pacientes. Assim, argumentaremos que para uma teoria da dor atender a esses *desiderata*, ela deve se comprometer com a indispensabilidade do sistema nociceptivo.

Palavras-chave: Dor. Nociceção. Filosofia da dor. Filosofia da mente.

Introduction

Researchers studying the phenomenon of pain across various fields of knowledge have established a distinction between the nociceptive system and the conscious experience of pain (Melzack & Wall, 2003¹, Moayedi & Davis 2013², Mischkowski et. al. 2019³, Corns 2020⁴, Armstrong 2023⁵). On the one hand, the nociceptive system is part of the

¹ MELZACK, R., WALL, P. (Eds). *Handbook of Pain Management. A Clinical Companion to Wall and Melzack's Textbook of Pain*. Churchill Livingstone, Edinburg, 2003.

² MOAYEDI, M., DAVIS, K. Theories of pain: from specificity to gate control. *Journal of Neurophysiology*, v. 109, n. 1, p. 5-12, 2013.

³ MISCHKOWSKI, D., PALACIOS-BARRIOS, E., BANKER, L., DIDLINE, T., ATLAS, L. Pain or nociception? Subjective experience mediates the effects of acute noxious heat on autonomic responses. *Pain*, v. 160, n. 6: p. 1469-1481, 2019.

⁴ CORNS, Jennifer. *The Complex Reality of Pain*. New York, NY: Routledge. 2020.

⁵ ARMSTRONG, S., HERR, M. *Physiology, Nociception*. [Updated 2023 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK551562/>.

peripheral nervous system, with nerve cells distributed throughout the body. It is comprised by so-called nociceptive neurons, cells that capable of responding to noxious stimuli by secreting chemical signals from their peripheral nerve endings, converting thermal and mechanical stimuli into electrical signals and transmits these signals to the spinal cord and to the brain⁶. This system operates independently of the agent's conscious control.

On the other hand, the conscious experience of pain involves the awareness of pain, the ability to describe it, the ability to form intentions to act in ways that will help alleviate it, and so forth. It involves the central nervous system's "interpretation" of signals received from the nociceptive system. A well established fact among researchers is that the experience of pain is modulated by cognitive, emotional, and motor processes. Traditional conceptions of pain hold that this modulation takes place whenever nociceptive information – information travelling from the body part whereby the pain is located – reaches brain high-order brain centres, which might occur through various routes (Moayedí & Davis 2013). That is, pain modulation is a top-down process, whereas the nociceptive system works bottom-up.

Broadly speaking, traditional conceptions of pain are capable of offering a prompt and straightforward account of acute, localized pain. In such cases, it is common for patients to have resources to interrupt or reduce pain intensity, since the patient can readily identify where the pain is located, what it feels like and why it is happening. This implies that the patient, by virtue of being conscious of the pain, is capable of exerting some control over it. For instance, if a heavy object unexpectedly falls on top of my left big toe, causing pain, I can act so as to remove my toe from underneath the object, because I understand that the felt pain is being caused by compression, so that, if I can stop compression, the pain shall ease.

However, there are varieties of pain that do not seem to correspond to biomarkers nor to involve this conscious understanding of their own phenomenology, in that, in such cases, it is not immediately clear (to the patient or to clinicians) where in the body the pain is located, what type of sensation is present (whether it is compression, burning, tearing, and so forth), nor what might be causing it. This is the case with various types of chronic pain conditions, as well as with phantom limb pain. Chronic pain, such as fibromyalgia, which is our primary focus here, lasts for more than three months and commonly presents as diffuse or non-localized (IASP, 2020)⁷. In fibromyalgia, there is no specific area of the body that

⁶ ARMSTRONG, *op. cit.*

⁷ This definition is from The International Association on the Study of Pain (IASP), the leading global organization supporting the study and practice of pain and pain relief. The formal IASP's definition of chronic pain can be read in full at <https://www.iasp-pain.org/resources/topics/chronic-pain/>.

the patient can point to as being the area that hurts, and as a result of that they cannot possibly exert control over it. Chronic pain represents a significant challenge in public healthcare. In Brazil, for instance, 37% of the population over 50 years of age suffer from some form chronic pain⁸. Typically, patients report feeling pain that manifests constantly, even though medical tests fail to detect any physical abnormalities.

Due to its peculiarities, chronic pain seems to call for a different explanation, one that does not place nociception as the primary basis of the pain experience. Indeed, if there appears to be nothing triggering the nociceptive system, a natural assumption to make is that the focus of the explanation must shift to cognitive and emotional processes. These processes are understood as autonomous in the sense that they completely permeate the phenomenon of pain. The nociceptive system, whose access is limited to a third-person perspective, therefore lacks a relevant explanatory role when it comes to chronic pain, such as fibromyalgia, whereby there is no physical process causing mechanical compression, or burning, or tearing of any specific body part, yet the patient claims to be in pain, sometimes intense and debilitating. One consequence of this is that first-person pain reports acquire decisive importance. If nothing physically wrong is detected through medical examinations, the patient's account remains as the primary source of evidence that there is pain, to begin with. In this domain, the patient is regarded as enjoying some form of authority over their own reports. What they say is, thus, understood as needing to be taken *prima facie*.

One of the goals of this paper is to highlight a problem with this reasoning. A review of pain reports allows us to see that patients' authority over their own accounts does not always exist. Firstly, because the reports are often confusing and difficult to make sense of. Secondly, and most importantly, because patients themselves do not feel in control of their own narratives. In some cases, as we shall see, it seems as though there is something unspeakable about the pain they experience, almost as if the pain could speak for itself without the need for words. Now, if chronic pain was entirely modulated by cognitive and emotional processes operating in a top-down manner, patients would feel in control of their descriptions. They would be able to monitor and see that the way they are describing the felt pain corresponds to what they are actually feeling. This expectation reflects the thesis that cognitive and emotional processes are active or constructive, generating a subjective experience of control

⁸ This data is from Brazil's Ministry of Health. See the 2023 report "Pesquisa aponta que quase 37% dos brasileiros acima de 50 anos têm dores crônicas", available at the Ministry of Health's website: <https://www.gov.br/saude/pt-br/assuntos/noticias/2023/dezembro/pesquisa-aponta-que-quase-37-dos-brasileiros-acima-de-50-anos-tem-dores-cronicas>.

(Hutto; Gallagher, 2017⁹; McDowell, 1994¹⁰). The problem, however, is that the explanatory emphasis on these capacities overlooks the predicament of the very patient. What the chronic pain patient experiences is not just pain, but also passivity, impotence and lack of control in relation to their own pain. As one patient once remarked, “I knew there was something wrong, but I didn’t know what”¹¹. We believe, thus, that one thing that is missing from this explanatory model (the traditional view of pain) is some external pressure—something outside the agents’ cognitive capacities—to account for their perceived lack of control.

In this way, we wish to call attention to the content of certain chronic pain reports, which, as we will argue, call for reconsideration of the nociceptive system as an indispensable (constitutive) element of chronic pain phenomena. Specifically, contrary to the explanation that emphasizes the top-down influence of cognition and emotion over pain experience, there is reason coming from philosophy of mind as well as from the neurosciences, for believing that, in addition to cognitive and emotional processes, the nociceptive system plays a fundamental role in the processes underpinning chronic pain phenomena.

The remainder of the paper is structured as follows: in the first section, we will evaluate the dispensability view, the view that considers the nociceptive system as having a non-constitutive role in acute pain processes and no place whatsoever in the explanation of chronic pain. In this section, it will become apparent that this explanatory model fails to address two *desiderata* in the explanation of chronic pain: first, the fact that interoception goes beyond the agent’s conceptual resources through which they could describe chronic pain processes; second, recent empirical findings pointing to a central role of the nociceptive system in the interoception of pain. In the second section, we will examine philosophical arguments supporting the thesis that the content of perception—whether interoceptive or exteroceptive—that fits within conceptual descriptions is sparse. Perceptual contents of great magnitude, whether they have positive or negative valence, often exceed the agent’s conceptual repertoire. In the third and final section, we will bring to light recent empirical findings that point to an excess of interoceptive information caused by hypersensitivity of the nociceptive system. Whether from a philosophical or an empirical perspective, we have reasons to mitigate the influence of top-down processes in the experience of chronic pain by emphasizing the indispensable (bottom up) role of the nociceptive system.

⁹ Hutto, D.; Gallagher, S. Re-Authoring narrative therapy: improving our self-management tools. *Philosophy, Psychiatry and Psychology* 24 (2): 157-167

¹⁰ MCDOWELL, J. *Mind and World*. Harvard University Press, 1994.

¹¹ HILBERT, R. The Acultural Dimensions of Chronic Pain: Flawed Reality Construction and the Problem of Meaning. *Social Problems*, v. 31, n. 4, 365-378, 1984, *italics original*.

1. The Dispensability view

For many philosophers and neuroscientists, pain experience is a multi-dimensional phenomenon. One way to explain this multidimensionality is by considering the internal perception of pain (interoception), which involves cognitive and emotional aspects. The IASP definition seeks to encompass these different aspects: pain is a subjective experience influenced by biological, psychological, and social factors¹². However, it is not clear how this multidimensionality occurs. There are different ways in which the interplay of such aspects can influence pain experience, and there isn't one single way to understand this "influence". Different dimensions can be understood as modulating the intensity and threshold of pain, and/or as informing and shaping pain reports. Cognition or emotions can entirely alter the interoception of pain, its phenomenological character, or they may affect only how people describe their own pain experience (Wiech & Shriver, 2018¹³). It is certain that these positions will vary depending on the underlying theory that one chooses to work from. A theory that deploys the concept of *interoceptive encapsulation* (as in, e.g., Todd et. al. 2022¹⁴), for instance, does not account for the influence of cognitive and emotional aspects, whereas theories that, in various ways, support *cognitive penetration* are committed to recognizing substantial effects of these aspects (Wiech & Shriver, 2018).

It is not our aim here to delve into the details of these approaches. Our paper focuses on the claim that cognitive and emotional processes thoroughly permeate interoception. Many researchers have committed themselves to this claim, although not always in the same way (Gligorov, 2019¹⁵; Corns 2020, Kirvenstein, 2022¹⁶). Much of the appeal of this claim stems from the neuromatrix theory, a seminal theory proposed by Ronald Melzack.¹⁷ This theory purports that cognition and emotion are adaptive processes that fully participate in the pain experience. According to the neuromatrix theory, the domains of cognition and emotion would contain internal inferential models that could interfere with the pain experience.

¹² This is the IASP's 2020 revised definition of pain. Available at <https://www.iasp-pain.org/publications/iasp-news/iasp-announces-revised-definition-of-pain/>, 2020.

¹³ WIECH, K., SHRIVER, A. Cognition Doesn't Only Modulate Pain Perception; It's a Central Component of It. *AJOB Neuroscience*, v. 9, n. 3, p. 196-198, 2018.

¹⁴ TODD, J., SWAMI, V. ASPELL, J. FURNHAM, A., HORNE, G., STIEFER, S. Are some interoceptive sensibility components more central than others? Using item pool visualization to understand the psychometric representation of interoception. *PLoS One*, v. 17, n. 12, p. e0277894, 2022.

¹⁵ GLIGOROV, N. Telling the Truth about Pain: Informed Consent and the Role of Expectation in Pain Intensity. *AJOB Neuroscience*, v. 9, n. 3, p. 173-182, 2019.

¹⁶ KIVERSTEIN, J.; KIRCHHOFF, M.; THACKER, M. An embodied processing theory of pain. *Review of Philosophy and Psychology*. 13: p. 973-998, 2022.

¹⁷ MELZACK, R. From the gate to the neuromatrix. *Pain Supplement* (6), p. 121-126, 1999.

The adaptive process here involves reducing the discrepancy between these internal models, which operate in a top-down manner, and the afferent information, which operates in a bottom-up manner. The balance between this bidirectional information flow constitutes the organism's homeostasis.

According to Kirvenstein (2021), a signal generated by receptors dedicated to transmitting pain information (nociceptors) is not passively processed by the brain areas responsible for interoception. On the contrary, interoception, which is intimately connected to cognition and emotion, produces inferences from internal models with the aim not only of interpreting the pain signal but also of predicting what will happen next. Wiech and Shriver (2018) argue that the interoceptive experience of pain is entirely modulated by processes operating in a top-down direction. It is, in short, an active experience. According to this line of thought, interoception, insofar as it involves consciousness, is not identical and cannot be equated with the nociceptive system.

As we saw, the nociceptive system consists of a vast set of receptor cells distributed throughout the body. Their function is to transform harmful thermal and mechanical impulses into electrical stimuli. These stimuli are transported to the spinal cord and then to the brain. It should be noted that this system operates at a subpersonal level, transmitting information independently of the subject's conscious awareness. As such, the nociceptive system also functions independently of the subject's control. In contrast, in interoception, the subject is aware of the pain stimulus. In this domain, subjects are able to interpret the stimulus, pointing to the painful region, to the event that has caused it, and, depending on the situation, interfering with the pain experience in different ways. For example, they can shift their attention away from the painful region to other stimuli, or they can perform actions that minimize the intensity of the experience (for instance, remove or protect the body part where the pain is located); they can describe what is happening, reflect on the causes of the injury, and so on.

In this way, Weich and Shriver (2018) argue that the higher brain layers can modulate or even alter the trajectory of the pain stimulus, potentially interrupting its passage and completely nullifying it. Call this position of as the "dispensability view". The central point of this view is that the nociceptor system has only a contingent impact on the pain experience – nociceptive activation is dispensable for the pain experience, which might occur with or without it. Thus, according to Weich and Shirver, the nociceptive system is not constitutive of the pain experience. As Gligorov puts it:

[the brain] modulates the input transmitted from nociceptors to the transmission cells (T cells) located in the dorsal horn of the spinal cord. (...) The cognitive and evaluative element of pain is localized in the neocortical areas of the brain. Based on this theory, the cognitive aspects of pain can have an inhibitory effect and can change the output from the dorsal horn, pre-

venting the projection of the pain signal into the brain. Cognitive processes can affect both the sensory and discriminative aspects of pain as well as its affective and motivational aspects.¹⁸

A different, less technical, way to write the dispensability view down is offered by Corns:

Nociception [is] the processing of high-threshold inputs via thermal, mechanical, and pressure receptors which are preferentially sensitive to such inputs, i.e. so-called nociceptors. But pain as reported and even nociception doubly dissociate: nociception frequently occurs without pain being reported or evinced in any other behaviours, and pain is frequently reported and evinced across many behaviours without the occurrence of nociception¹⁹.

At first glance, the dispensability view appears to enjoy excellent explanatory power over cases of pain that are not localized in any specific body part, and that are inherently difficult to explain, such as chronic pain and phantom limb pain. It could also explain how certain practices, such as meditation and prayer, can modulate the pain experience (Najem et al., 2023²⁰). Even when there is no apparent activation of the subject's nociceptive system to which we could relate the pain experience, those subjects claim to feel pain. A localizationist approach, which would consider only a bottom-up process, would not be sufficient to explain these cases.

In short, a merely passive approach to pain processes does not account for their multidimensional nature, but the theory presented above appears to accommodate such cases, since it opens up the possibility that the cognitive aspects of pain might interfere with nociception and, thus, interfere with the pain experience as a whole. In specific, this theory accommodates nicely cases such as the one discussed by Beecher (1956²¹) whereby the subject has suffered significant bodily damage, but feels no pain. Beecher presents the cases of soldiers that have suffered severe injury in the battlefield, and are aware of the nature of the injuries, but report no pain – the pain experience that would otherwise be there is not there because it has been interfered with (by top-down modulation).

Whereas the multidimensional nature of pain is a reasonable thesis, as well as the influence of the cognitive and emotional dimensions of pain on the very experience, the dispensability view is not. This view fails to account

¹⁸ GLIGOROV, *op. cit.*, p. 174-175.

¹⁹ CORNS, *op. cit.*, p. 6.

²⁰ NAJEM, C., MEEUS, M., CAGNIE, B., AYOUBI, F., AL ACHECK, M., VAN WILGEN, P., VAN OOSTERWIJCK, J., DE MEULEMEESTER, K. The Effect of Praying on Endogenous Pain Modulation and Pain Intensity in Healthy Religious Individuals in Lebanon: A Randomized Controlled Trial. *Journal of Religion and Health*, v. 62. n. 3, p. 1756-1779, 2023.

²¹ BEECHER, H. Relationship of significance of wound to pain experienced. *Journal of the American Medical Association*, v. 161, n. 17, p. 1609-1613, 1956.

for cases that are somewhat the opposite of the soldier's case, alluded to – cases in which the patient has the experience but is incapable of providing a credible verbal, conceptually informed, report of the injury. A particular feature of chronic pain patients' reports is the fact that this experience goes beyond the descriptive or conceptual repertoire that could capture it. The view put forward by Gligorov (2019) and Weich & Shriver (2018) fails to account for those cases because it has the implication that their pain, once it has been processed by high-order cognition, would be available to conceptualization and description, whereas in reality that is not the case.

In addition, that theory neglects recent empirical findings pointing to hypersensitivity of the nociceptive system as a central physical element of chronic pain, as we will see next. Those two aspects are inter-related in the following way: the hypersensitivity of the nociceptive system overloads interoception, making it difficult, if not outright impossible, for individuals to describe their pain experience. Any theory of pain should aim to satisfy those desiderata, i.e., should be capable of accommodating the nonconceptual nature of the content of pain experience, as well as recent empirical findings showing that patients are not able to track, conceptualize and describe their pain; which the dispensability view does not.

2. The first desideratum: the nonconceptual content of chronic pain reports

As we have seen, it seems that the idea that the nociceptive system has a mere contingent impact on the pain experience grants significant importance to the reports of chronic pain patients. In the face of the difficulty in finding a physical phenomenon traceable by conventional medical instruments, something that would be done in the third-person, the patient's report remains as something that cannot only guide treatment, but also reliably describe the symptoms of pain. To the extent that the multidimensional nature of pain is assumed, such reports are indeed important. This idea may give the impression that patients are in control of their reports, as if though were free to choose the most adequate words and construct detailed narratives about their own pain.

Indeed, if we consider that the nociceptive system has a mere contingent impact on the pain experience, then it is tempting to claim that patients are in control of the conceptual articulation presented in these reports. Such reports would not be constrained by anything other than principles of rationality that would make them coherent, and this is precisely what would underpin first-person authority. However, this argument is problematic. A simple examination of chronic pain reports reveals that this is

not the case. Before discussing these reports, however, let us consider this point in more detail through an analogy with reports on the perception of the external world (exteroception).

When we perceive objects in the external world, our reports are subject to conditions of adequacy; that is, they may or may not correctly describe what we experience. A necessary condition for these reports to be true is the fact that the external world exerts an authority over our perception. This means that we do not have control over what we perceive, and this at least partially constrains the descriptive judgment about what we perceive. Our reports are true when they are sensitive to the impacts that the world exerts on our perception and false otherwise. Without the influences that the external world exerts on our perceptual system, which certainly includes impacts on the receptor cells of the sensory organs up to the information processed in the visual cortex, it is not possible to guarantee the epistemic reliability of these reports.

It is true that pain perception has peculiarities that render it different to perception of the external world. For example, in cases where there are perceptual errors concerning external phenomena, we can dismiss the perceptual content, considering it as illusory. However, this does not seem to be the case with pain. The fact that we might suspect we are hallucinating about the sensation of pain may not suppress the corresponding experience. Nor does it seem possible to correct our own pain experience based on another person's account that would consider it illusory. However, if our pain reports are not constrained by anything other than the conceptual realm in which they are situated, it is uncertain that they have epistemic reliability. In the next section, we will discuss recent empirical research that has brought the nociceptive system back into focus. This will allow us to defend the argument for the indispensability of the nociceptor system as the best explanation for chronic pain reports. These studies indicate that it is precisely this system that constrains pain reports, even in many cases of chronic pain. For now, let us look at some examples of chronic pain reports. It should become clear that patients do not feel in control of the description of their reports, as they should, if dispensability was the case.

Let us examine some examples:

"I try to speak to doctors about the severity of my pain. My words float strangely in the air. As I pronounce them, I myself become a spectator. As I soon as I begin to speak, I am no longer there."²²

I honestly don't know what it is. And that's pretty frustrating a lot of times. Just the fact that I don't know what it is, you know. I've been frustrated with that. Well, what is this goddamn thing? Why do I have these

²² WASSON, S. Before Narrative: episodic Reading and representations of chronic pain. *Discourse Identity*, p. 1, 2016.

headaches? The pain is something I can't do anything with. It's out there, it's something that I can't do anything with... It's really been hard for me to deal with that.²³

It was like I felt that there was a part of me that they didn't know about. I couldn't tell people about my pain, so I felt distant and I felt different, I felt like a freak, and no one knew, but I knew I was different.²⁴

"It's like a demon in my head playing chess with me and he makes his move. Every once in a while I'll catch up with him, and then he brings his queen out. Stress definitely plays a part in it... but you never know what part it plays. Sometimes it'll play a part where... it almost seems like more energy. And many times it just drains the ever-loving daylight out of me, and you never know what's going to happen when. Therapists who thought definitely it was stress, they got me, you know, I'd start to think, yeah, that must be right, you know, I'd start to lean more that way. Then after I'd stop seeing them, I'd think well, no, that wasn't true. I mean that's why I'd stop seeing them, because I'd get sick of it. Some of the things I told are changed now. I'm telling you something different. I've had to make adjustments in the patterns. If there is such a thing as a pattern. I'm really not sure that there is... Maybe it can be the way you feel at the time of the interview."²⁵

How can we make sense of these first-person reports? It is important to initially note the absence of self-control that appears in these three excerpts. It is true that all pain involves some sense of loss of control, but this sensation comes in varying degrees. In the case of chronic pain, the process seems to acquire a certain autonomy, to the extent that the subject experiences it as a confused and uncontrollable intrusion. It is as if the pain has a "life of its own", as a phenomenon that, despite being internal, does not offer itself to description. This issue challenges the common belief that pain is an exclusively private experience. The general understanding is that no one can feel another person's pain. It is presumed that each person has private access to the specifics of their particular pain. Thus, the very person experiencing the pain is thought to be in a better position than anyone else to describe exactly what the pain feels like, how intense it is, how it fluctuates, and so forth. As we have seen, the underlying assumption is that the subject is in control of their description. However, as the reports illustrate, it is not the case that the subject enjoys such control. Note that those subjects occupy a passive position, regarding something that is unspoken, that traverses and constrains them.

Consider again a technical definition of chronic pain. According to the IASP definition of chronic pain referred to before, it is defined as pain that persists for more than three months, even after the healing of any tissue

²³ HILBERT, R. The Acultural Dimensions of Chronic Pain: Flawed Reality Construction and the Problem of Meaning. *Social Problems*, v. 31, n. 4, p. 374, 1984.

²⁴ *Ibidem*, p. 365

²⁵ *Ibidem*, p. 372.

injury that might have been there. It may also accompany a persistent injury and involves psychological mechanisms. As is well known, chronic pain has a significant impact on individuals' quality of life, affecting their daily activities, sleep, and overall well-being. Certainly, chronic pain is a highly varied phenomenon. It is not our intention here to classify the types of chronic pain or to delve into specific aspects. Given our objectives, we would like to emphasize the aspect of chronic pain related to patients' difficulty in understanding it.

Many accounts from individuals suffering from chronic pain highlight a struggle to find concepts and words that accurately describe their experiences. To better understand these cases, it may be useful to establish two contrasts: first, with typical cases of exteroception, and second, with typical cases of interoception. Firstly, chronic pain cases differ from ordinary exteroceptive experiences, where the phenomenological content is easily assimilated into the subject's descriptive repertoire. These exteroceptive experiences can typically be explained by attention. Usually, the visual field consists of various objects, but only a select few enter the subject's attentional focus. The subject is aware of their exteroceptive experience to the extent that these objects are within their attention. Due to the limits of attentional resources, the content of that which we are aware of is sparse.

Secondly, a similar phenomenon occurs in interoception. The subject may shift their focus to heartbeats, digestion, or the reproductive system. In each case, inner attention is directed towards an internal region. A similar situation arises in transient or acute pain cases, whereby attention is immediately mobilized to a specific bodily location. It is noteworthy that, in both cases, the sparse nature of perceptual content ensures that it can be described using concepts. Even in situations where there may be difficulty naming the pain, attention is still present. The mere possibility of localization provides some control over the description.

However, there are cases in which perceptual experience transcends this repertoire. In instances whereby exteroception consists of positive feelings, research indicates that the exteroceptive magnitude may exceed the agents' conceptual repertoire. This is often the case when what is perceived is perceived as great, or magnificent, that elicit awe and wonder, as discussed by Gallagher et. al. (2015)²⁶. Similarly, but in a negative sense, the interoceptive experience of chronic pain appears to surpass the conceptual framework that individuals possess to describe their internal states. As we shall see in the accounts below, in these cases, interoception is inundated by an extensive informational cluster, effectively neutralizing attentional resources.

²⁶ GALLAGHER, S., REINERMAN-JONES, L., JANZ, B., BOCKELMAN, P., TREMPER, J. *A Neurophenomenology of Awe and Wonder: towards a non-reductionist cognitive science*. Palgrave MacMillan, 2015.

One might suspect that the issue lies in the lack of specificity in common concepts, and that more specific or technical terms could better describe the interoceptive experience. However, this is not the case. Even the McGill Pain Questionnaire (Melzack 1975²⁷), which includes over sixty sensory, affective, and evaluative terms, is insufficient to capture the entirety of chronic pain, or even to capture it with accuracy. As Melzack himself and others, such as Jurecic (2012)²⁸ observed, chronic pain patients struggle to comprehend the terms deployed by the questionnaire²⁹. As the accounts below illustrate, there exists an inherent difficulty related to the phenomenon of chronic pain itself, suggesting that it does not depend on a more precise vocabulary that could be developed for this purpose. Given that chronic pain is a widely distributed phenomenon in the global population, it also seems unlikely that there could be cultures with more or less sensitive vocabularies for this phenomenon. In summary, the descriptive deficit of chronic pain appears to be an objective problem.

Let us summarize what has been presented thus far. We have observed that the argument for dispensability in cases of chronic pain is insufficient to address an important desideratum of pain theories, namely the non-conceptual nature of the phenomenon and, consequently, the fact that chronic pain patients offer confusing and conceptually dis-organized reports of their own pain. In this regard, we suggest that the problem lies, among other mechanisms, in the nociceptor system. One possibility is that alterations in information processing within this system result in an interoceptive overload. Thus, the nociceptor system is indispensable for explaining the various manifestations of chronic pain. We now turn to present empirical data that may lend plausibility to our hypothesis. This will be addressed in the next section.

3. The second desideratum: new empirical findings and their implications

To clarify this second desideratum, it is worth considering recent research that highlights interoception as a central element in the causation of chronic pain. The interoceptive ability in question pertains to the capacity

²⁷ MELZACK, R. The McGill Pain Questionnaire: Major properties and scoring methods. *Pain*, v 1., n.3, p. 277-299, 1975.

²⁸ JURECIC, A. (2012). *Illness as narrative*. Pittsburgh: University of Pittsburgh Press; 2012.

²⁹ It has been acknowledged early on that the usefulness of the questionnaire hinges on the patient's understanding the meaning of the words, and that the ones that are beyond the patient's vocabulary may need to be defined (Melzack *op. cit.*, p. 282). Also, as Jurecic remarked, in being submitted to the questionnaire, patients are asked to pick from a wide pool of words those that better answer the question "What does your pain feel like?". The pool is comprised by 78 descriptors in 20 subclasses. The problem is that some of those descriptors are words that the average person is not familiar with, and wouldn't normally use, such as "rasping" and "lancinating".

to discriminate internal stimuli through the use of attention, referred to as interoceptive sensitivity or accuracy, which exists in varying degrees. According to Oliveira et al. (2024), this sensitivity serves a self-regulatory function, modulating processes such as temperature, digestion, and pain. The central focus of Oliveira et al.'s investigation was whether a reduction in this ability, resulting in low accuracy, could have a causal impact on chronic pain. In general, the study took into account questionnaires addressing various parameters related to self-regulation, such as the ability to monitor internal stimuli, avoid stress, and distract oneself from pain, among others.

The results indicated that individuals with high interoceptive sensitivity displayed higher levels of attention regulation toward bodily sensations, as well as greater trust in their bodies and the ability to listen to their bodies as a foundation for self-regulatory behaviours. In contrast, the profile of low interoceptive sensitivity exhibited lower levels of trust in the body and greater difficulty in dealing with bodily sensations, such as regulating internal sensations. This suggests that chronic pain patients face greater challenges in self-monitoring.

This point was well elucidated in a recent meta-analysis. As in the experiment mentioned above, Horsburgh et. al. (2024)³⁰ concluded that patients reporting chronic pain exhibit low interoceptive accuracy. Experiments evaluating accuracy typically involve interoceptive tasks, such as counting one's own heartbeats, compared against objectively measured data. The closer the individual's performance aligns with these objective measures, the higher their accuracy. Various experiments have shown that higher interoceptive accuracy is associated with greater pain tolerance, whereas chronic pain patients exhibit low interoceptive accuracy. This indicates a lack of precision in self-monitoring. Interestingly, the same chronic pain patients report high levels of interoceptive sensitivity. This sensitivity pertains to how aware individuals claim to be of their own pain. To measure this type of sensitivity, the Body Awareness Questionnaire (Shields, Mallory & Simons, 1989³¹) is commonly used, whereby individuals rate themselves on a scale from zero (not at all aware) to five (extremely aware). In sum, research highlights a positive correlation between low interoceptive accuracy and high levels of pain awareness.

How could these results be interpreted? At first glance, they appear counterintuitive. Intuitively, one might assert that the more aware an

³⁰ HORSBURGH, A., SUMMERS, S., LEWIS, A., KEEGAN, R., FLOOD, A. The Relationship Between Pain and Interoception: A Systematic Review and Meta-Analysis. *The Journal of Pain*, v. 25, n. 7, p. 1044-76, 2024.

³¹ SHIELDS, S., MALLORY, M., SIMON, A. The Body Awareness Questionnaire: Reliability and validity. *Journal of Personality Assessment*, v. 53, n. 1, p. 802-815, 1989.

individual is of their pain, the greater their interoceptive precision or accuracy would be. Thus, low levels of accuracy would intuitively correlate with low levels of awareness regarding one's own pain. Let us examine this phenomenon through the lens of predictive processing theory, which, as we have seen, has been employed to support the dispensability view. Good levels of accuracy are explained by the correction of expectations and predictions about the interoceptive signal. The greater the individual's control, the higher the accuracy of their predictions. This control can be accounted for precisely by the expectations associated with interoceptive awareness.

Certainly, not all expectations underlying predictive inferences are conscious. There are automatic or implicit models that carry optimized expectations, whereby conscious attention may introduce noise. However, in many cases, internal or external events within the reach of consciousness are associated with expectations that, in turn, generate correct predictions. The more conscious an individual is of a phenomenon, the greater the attention they can allocate to processing this information. This can reduce predictive error by improving the integration of evidence from different sensory channels. This process may produce high-level predictions and refine internal models, increasing their precision. Thus, we can generally say that a phenomenon of which an individual is conscious is also a phenomenon about which they hold expectations with high predictive power. However, the findings of this meta-analysis demonstrated precisely the opposite. What could explain these findings?

According to our explanatory hypothesis, pain awareness without accuracy occurs due to a hypersensitization of the nociceptive system. This hypersensitization causes an informationally overloading interoception. It completely absorbs the patient's attention, generating an interoceptive hyperfocus. It is as if an informational excess floods interoception. Thus, it is not a sparse interoceptive content that could be accommodated within the patient's conceptual repertoire. As a result, the chronic pain patient struggles to integrate interoceptive pain information. She has difficulty with mobilizing it within an inferential context, producing a coherent narrative about it, and so forth. The patient becomes passive in relation to their own pain, lacking any control over it, including control over conceptual and linguistic resources to describe it.

We believe that the explanation pointing to hypersensitization and, consequently, to attentional hyperfocus brings the nociceptive system back into play, as a key component of what is going on. As we have seen, the high levels of pain awareness, accompanied by low accuracy, can be explained by an informational excess that floods interoception. Ultimately, this accounts for the patients' sense of lack of control, as well as their lack of resources to manage their own pain. Therefore, it does not

seem plausible to exclude the nociceptive system from the explanation of chronic pain. It is important to note that our explanatory hypothesis does not dismiss the top-down modulation of cognitive and emotional processes. However, it certainly mitigates their influence, as the bottom-up process of nociception holds at least equal explanatory weight in the phenomenon of chronic pain.

Final Remarks

In this paper the case was made that the nociceptive system needs to be understood as a constitutive (rather than contingent) part of pain experience, if a pain theory is to be able to account for subjects difficulty expressing their pain through higher-order cognitive skills as well as recent scientific findings showing that an individual's ability to accurately sense internal signals is decreased in those with chronic pain, despite them reporting being more aware of internal sensations. If it was true that top-down processes were the primary factor underpinning chronic pain, they we should expect chronic patients to be able to provide accurate, informative and intelligible pain reports, as well as to display higher ability to accurately sense internal signals (interoception), neither of which is the case.

Contrary to what we have here termed the dispensability view, nociception appears to be needed for the best explanation for what is going on in cases of chronic pain whereby there is no physical biomarker or correlate of tissue damage (actual or potential), but the subject claims to be under high levels of pain nonetheless. As such, the dispensability view fails to address two *desiderata* of pain theories and should, therefore, be reconsidered.

References

- ARMSTRONG, S., HERR, M. Physiology, Nociception. [Updated 2023 May 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available at: <https://www.ncbi.nlm.nih.gov/books/NBK551562/>
- BEECHER, H. Relationship of significance of wound to pain experienced. *Journal of the American Medical Association*, v. 161, n. 17, p. 1609-1613, 1956.
- CORNS, Jennifer. *The Complex Reality of Pain*. New York, NY: Routledge. 2020.
- GALLAGHER, S., REINERMAN-JONES, L., JANZ, B., BOCKELMAN, P., TREMPER, J. *A Neurophenomenology of Awe and Wonder: towards a non-reductionist cognitive science*. Palgrave MacMillan, 2015.

- GLIGOROV, N. Telling the Truth about Pain: Informed Consent and the Role of Expectation in Pain Intensity. *AJOB Neuroscience*, v. 9. n. 3, p. 173-182, 2019.
- HILBERT, R. The Acultural Dimensions of Chronic Pain: Flawed Reality Construction and the Problem of Meaning. *Social Problems*, v. 31, n. 4, 365-378, 1984, *italics original*.
- HUTTO, D.; GALLAGUER, S. Re-Authoring narrative therapy: improving our self-management tools. *Philosophy, Psychiatry and Psychology* 24 (2): 157-167
- HORSBURGH, A., SUMMERS, S., LEWIS, A., KEEGAN, R., FLOOD, A. The Relationship Between Pain and Interoception: A Systematic Review and Meta-Analysis. *The Journal of Pain*, v. 25, n. 7, p. 1044-76, 2024.
- JURECIC, A. *Illness as narrative*. Pittsburgh: University of Pittsburgh Press; 2012.
- KIVERSTEIN, J.; KIRCHHOFF, M.; THACKER, M. An embodied processing theory of pain. *Review of Philosophy and Psychology*. 13: p. 973-998, 2022.
- MCDOWELL, J. *Mind and World*. Harvard University Press, 1994.
- MELZACK, R. The McGill Pain Questionnaire: Major properties and scoring methods. *Pain*, v. 1., n. 3, p. 277-299, 1975.
- MELZACK, R. From the gate to the neuromatrix. *Pain Supplement* (6), p. 121-126, 1999
- MELZACK, R., WALL, P. (Eds). *Handbook of Pain Management. A Clinical Companion to Wall and Melzack's Textbook of Pain*. Churchill Livingstone, Edinburg, 2003.
- MISCHKOWSKI, D., PALACIOS-BARRIOS, E., BANKER, L., DIDLINE, T., ATLAS, L. Pain or nociception? Subjective experience mediates the effects of acute noxious heat on autonomic responses. *Pain*, v. 160, n. 6: p. 1469-1481, 2019.
- MOAYEDI, M., DAVIS, K. Theories of pain: from specificity to gate control. *Journal of Neurophysiology*, v. 109, n. 1, p. 5-12, 2013.
- NAJEM, C., MEEUS, M., CAGNIE, B., AYOUBI, F., AL ACHECK, M., VAN WILGEN, P., VAN OOSTERWIJCK, J., DE MEULEMEESTER, K. The Effect of Praying on Endogenous Pain Modulation and Pain Intensity in Healthy Religious Individuals in Lebanon: A Randomized Controlled Trial. *Journal of Religion and Health*, v. 62. n. 3, p. 1756-1779, 2023.
- OLIVEIRA, Inês; GARRIDO, Margarida; CARVALHO, Helena; BERNARDES, Sônia. Sensing the body matters: profiles of interoceptive sensibility in chronic pain adjustment. *Pain*, 165, p. 412-422, 2024.
- TODD, J., SW Shields, S., Mallory, M., Simon, A. The Body Awareness Questionnaire: Reliability and validity. *Journal of Personality Assessment*, n. 53, v. 1, p. 802-815, 1989. AMI, V. ASPELL, J. FURNHAM, A., HORNE, G., STIEFER, S. Are some interoceptive sensibility components more central than others? Using item pool visualisation to understand the psychometric representation of interoception. *PLoS One*, v. 17, n. 12, p. e0277894, 2022.
- SHIELDS, S., MALLORY, M., SIMON, A. The Body Awareness Questionnaire: Reliability and validity. *Journal of Personality Assessment*, v. 53, n. 1, p. 802-815, 1989.

WASSON, S. Before Narrative: episodic Reading and representations of chronic pain. *Discourse Identity*, 2016

WIECH, K., SHRIVER, A. Cognition Doesn't Only Modulate Pain Perception; It's a Central Component of It. *AJOB Neuroscience*, v. 9, n. 3, p. 196-198, 2018.

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