Pain Linguistics: A Case for Pluralism

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Under Review

Abstract

The most common approach to understanding the semantics of the concept of pain are third-person thought experiments. By contrast, the most frequent and most relevant use of the folk concept of pain concerns a first-person perspective in conversational settings. In this paper, we use a set of linguistic tools to systematically explore the semantics of what people communicate when reporting pain from a first-person perspective. Our results suggest that only a pluralistic view can do justice to the way we talk about pain: The semantic content of the folk concept of pain consists of information about both an unpleasant feeling and a disruptive bodily state. Pain linguistics thus provides an interesting challenge to the dominant unitary views of pain, as well as new insights into ordinary pain language.

Keywords

folk concept of pain; bodily states; feeling pain; paradox of pain; deniability test; projection test

1. Introduction

What is pain? In the philosophical tradition, this question has received a somewhat univocal answer. For example, according to Lewis (1980, p. 222), "Pain is a feeling. Surely that is uncontroversial. To have pain and to feel pain are one and the same". In a similar vein, Tye (2017, p. 478) stated: "If I am in pain, I feel pain, and if I feel pain, I am in pain". This understanding of pain also appears to prevail in the medical sciences. Most prominently, the International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience" (Raja et al., 2020, p. 1977). These definitions do not aim to introduce a technical term for the sole purpose of philosophical or scientific discussion, but aim to capture the *folk concept of pain* (Goldberg et al., 2022). However, at first glance, the folk concept of pain is far less uniform than most common definitions suggest.

Hill (2005) argued that the folk concept of pain appeared to be oddly paradoxical, as it pulls into two directions that appear to mutually exclude each other. On one hand, people often treat pain as a subjective and private feeling, commonly characterized as being unpleasant or hurtful. On the other hand, people often treat pain as an objective and publicly accessible bodily state, widely identified as physical damage, disruption, or disturbance. This apparent paradox not only complicates the identification of the research subject for philosophical and scientific investigations (Aydede & Fulkerson, 2019; Bain, 2003; Coninx, 2020; Corns, 2020; Klein, 2015), but also indicates potential ambiguities in everyday language (Liu, 2021a; Salomons et al., 2021). These ambiguities might constitute a severe source of miscommunication among medical staff, health care providers, caregivers, and laypeople when reporting pain. Thus, understanding the folk concept of pain and whether or not it is paradoxical has significant implications for understanding, treating, and interacting with pain patients (Cormack et al., 2022; Setchell et al., 2017; Stilwell & Harman, 2017).

In this paper, we aim to empirically investigate the folk concept of pain by examining what people communicate when making *first-person pain reports*, such as "I have a pain in my arm". More specifically, our goal is to determine the content that belongs to the semantic meaning of the concept of pain and that which is only conversationally implicated. Linguists have devised three tests to examine the type of information that is communicated, namely the implication, projection, and deniability tests. We applied these tests in three preregistered experiments and found that pain linguistics provides a new, useful method to study the folk concept of pain. Based on the results of our experiments, we argue for a *pluralistic view*. We suggest that paradigmatic first-person pain reports semantically entail information about both an unpleasant feeling and a disruptive bodily state. This view is in sharp contrast to the unitary views that predominate in recent literature, and only consider one of these aspects as part of the semantic content of the folk concept of pain.

The paper is structured as follows. In Section 2, we introduce the most prominent views on the folk concept of pain. We critically discuss recent methodological approaches to the study of the folk concept of pain. Section 3 introduces our new experimental-linguistic approach to the folk concept of pain, while Section 4 presents the results of our first preregistered experiment using the implication and projection tests. Section 5 provides the results of the second experiment using the deniability test. Based on these tests, we argue for a complex, pluralistic view in Section 6: Information regarding both a bodily disruption and an unpleasant feeling is communicated as part of the semantic content of the folk concept of pain. Furthermore, we discuss the potential methodological limitations of our design and the plausibility of different interpretations of the pluralistic view. In particular, we argue for a component view, which has not been considered sufficiently in the experimental-philosophical literature thus far.

2. Recent Approaches to the Folk Concept of Pain

Unitary views have been at the center of the debate concerning the folk concept of pain for the past decade. Unitary views assume that there is a single folk concept of pain, and that this folk concept has a distinct univocal meaning, referring either to a feeling or to a bodily state.

According to the *feeling view*, people commonly treat pain as a private and subjective feeling (Aydede, 2005, 2009; Tye, 2005, 2017). Some authors have characterized this aspect as referring to the subject's mental state more generally (Borg et al., 2020, 2021; Liu, 2021b). However, the typical way of thinking about pain as a mental state is to treat it as a conscious subject's feeling (Borg et al., 2021; Kripke, 1981; Lewis, 1980; Tye, 2017); that is, as unpleasant or hurtful, at least in paradigmatic cases (Coninx, 2022; Raja et al., 2020).

By contrast, according to the *bodily view*, people commonly treat pain as a public and objective bodily state (Kim et al., 2016; Massin, 2017; Reuter et al., 2014; Reuter & Sytsma, 2020). Some authors have assumed that this aspect of the folk concept of pain refers to the state of a body part without further specifications (Hyman, 2003; Liu, 2021b). However, the typical way of thinking about pain as a bodily state is to treat it as a particular physical condition of the (non-brain-based) body (Reuter, 2017; Salomons et al., 2021). While there is little agreement regarding the precise definition of this condition, most suggestions revolve around the idea of there being something physically wrong with a body part, as in the case of bodily damage, disturbance, or disruption (Borg et al., 2020; Reuter & Sytsma, 2020; Salomons et al., 2021).

Both unitary views have been criticized in the more recent literature for telling only one part of the story: People appear to be willing to treat pain as a feeling and as a bodily state (Borg et al., 2020; Liu, 2021b, 2021a; Reuter & Sytsma, 2021; Salomons et al., 2021). These considerations gave rise to a second major category of approaches, namely different versions of the *pluralist view*.

Pluralist views are united in rejecting the assumption of a (single) folk concept of pain with a univocal meaning. Different views concerning how feeling and bodily information relate to each other have been presented (Borg et al., 2019, 2020; Liu, 2021a, 2021b). For the present purposes, the most relevant characteristic of these different versions is that they agree that the folk concept of pain is not always treated as referring only to an unpleasant feeling or only to a disruptive bodily state. Instead, the folk concept of pain is assumed to be more complex than the different versions of the unitary view would have us believe (for a more detailed discussion, see Section 6.3.).

In 2010, experimental philosophers began to investigate the folk concept of pain empirically via *vignette studies*. These studies mainly serve the purpose of deciding between the two unitary views, namely the feeling view and the bodily view. As a result, they typically describe scenarios in which the agent either experiences a feeling or undergoes some bodily disturbance, whereas the other aspect is absent (Reuter et al., 2014; Reuter & Sytsma, 2020; Salomons et al., 2021). However, the empirical evidence is mixed, with some studies supporting the feeling view and others the bodily view. In the following, we quickly summarize the most influential and promising studies of the folk concept of pain.

Several studies have challenged the assumption that the folk concept of pain (always) refers to a subjective experience (Reuter, 2011; Reuter et al., 2014; Reuter & Sytsma, 2020; Sytsma, 2010; Sytsma & Machery, 2009). One direct consequence of this assumption is that pains cannot exist unfelt. However, the participants in several experimental studies were willing to ascribe pain to people in the absence of a corresponding feeling. For example, a majority of people believe a severely wounded soldier to have pain even if he does not feel any pain (Reuter & Sytsma, 2020). This finding might motivate the conclusion that the folk concept of pain only entails bodily aspects.

Other authors have challenged the assumption that the folk concept of pain (always) refers to a bodily state (Borg et al., 2020; Salomons et al., 2021). One direct result of this assumption is that pains cannot exist when there is no physical damage, disturbance, or disruption. However, in experimental studies, the participants were willing to ascribe pain to people who were lacking a corresponding bodily state. For example, a majority of people ascribed pain to people who reported feeling pain as a result of the direct stimulation of their brain without any (non-brain based) bodily changes taking place (Salomons et al., 2021).

These results indicate that, when the participants were presented with different scenarios, they were willing to ascribe pain even in the absence of an unpleasant feeling or a disruptive body state. Depending on the context provided and the amount of detail in which it is described, people treat pain as a feeling in some cases and as a bodily state in others.[1]

[1] While vignette-based and corpus-based studies have dominated the empirical investigations into the folk concept of pain, Liu (2021a) used linguistic methods to test for ambiguity in pain-related words such as "sore", "aching", and

The variability in people's responses might appear surprising and has often caused concern about the aptness of experimental research. A common objection is that ordinary people do not have sufficient competence with concepts; accordingly, we should only trust the intuitions of those who have the right kind of expertise: philosophers (for arguments along these lines, see, e.g., Hales, 2006; Horvath, 2010; Ludwig, 2007; Williamson, 2011). Such a reply seems misguided, given that philosophers are interested in the *folk concept* of pain and that every ordinary person has a lifetime of experience with pain. Alternatively, one might think that the folk concept of pain is inherently "messy" and can be pushed around quite easily, as the available data from vignette studies provide some evidence for all types of views that have been defended in recent literature.[2]

There is another way to think about the variability in people's judgments. We believe that well-documented experimental-pragmatic effects could partly explain the contrasting results. It has been argued that "pulling apart features that usually go together" can cause confusion in participants and affect their conceptual competence (see Machery, 2017, p. 117 ff. for an overview and discussion). While people are perfectly competent to apply the term pain in ordinary cases in which feeling and bodily aspects co-occur, they rarely experience cases in which one of the two is absent. Most vignette studies on the folk concept of pain do exactly that. Furthermore, Machery (2017) identified several other characteristics that might undermine the reliability of judgments that would otherwise be reliable. For example, while people are familiar with bruised knees, cut fingers, or headaches, few have been confronted with soldiers who have gunshot wounds but who do not feel any pain. Thus, while many of the vignettes used in this research were aimed at pushing a concept to its limits, they may have pushed too hard.

One might think that the vignette-based research on pain introduces an additional level of unfamiliarity. We are familiar with ascribing pain to ourselves or to people to whom we are very close (our children, partner, and friends) and with whom we interact. However, we rarely ascribe pain to someone we do not know based on minimal, text-based information. One might also think that ascribing pain to others is a non-trivial social act, particularly if one withholds the attribution of pain. Therefore, being overly willing to call an unclear case an instance of pain might be erring on the side of caution.

"hurting". Unfortunately, these tests cannot be performed directly for the term "pain". Accordingly, they do not provide a definite answer to the question of what people refer to in first-person statements, such as "I have a pain in my arm".

[2] Defenders of the feeling view could claim that people might consider pain to be a bodily state in some rather extreme cases, while the ordinary or dominant concept of pain is that of an unpleasant feeling. Conversely, defenders of the bodily view could claim that people might consider pain to be an unpleasant feeling in some rather extreme cases, while the ordinary or dominant concept of pain pertains to a disruptive bodily state. It might still be found that the everyday concept of pain is related exclusively to a feeling or exclusively to a bodily state. For example, people may be willing to treat pain as a bodily state or as a feeling in extraordinary situations due to the lack of a better term. Furthermore, different versions of the pluralist view might prove equally compatible with the outlined results of vignette-based studies (see Section 6.3).

To overcome these potential sources of distraction, we suggest a new approach to the folk concept of pain by focusing on pain linguistics. Instead of creating vignettes to address our concerns, we decided to have a speaker utter a first-person pain report and to ask participants what they inferred from such a statement. Situations in which someone says "I have a pain in my arm" were assumed to be more familiar to the participants, and such statements reliably trigger attempts to make sense of this statement. Crucially, our participants were not asked to judge whether the person had a pain. The person says that they have. What is relevant for us is the information that the addressee, in this case our participants, would infer from such a statement.

We consider the linguistic studies of first-person pain reports to be an innovative addition to our empirical toolbox. However, we do not suggest that pain linguists should replace vignette-based and corpus-based research. In Section 6, we discuss in particular the compatibility of our results with vignette studies, and we present the methodological and theoretical implications.

3. A New Approach: Implication, Projection, and Deniability

All attempts to understand the folk concept of pain are united by the search for the *semantic features* of this folk concept. Therefore, a promising approach appears to begin with identifying the features that are reliably conveyed when a speaker uses the concept of pain and then distinguishing the semantic features from those that are merely conveyed pragmatically. All the accounts, regardless of whether they are feeling views, bodily views, or pluralist views, first-person pain reports reliably convey two pieces of information; in the remainder of this paper, we refer to such implied content as implications:

[Feeling] The speaker has an unpleasant feeling.

[Bodily] Something is physically wrong with the speaker's body (or the speaker at least believes that something is physically wrong with their body).

Under normal circumstances, we consider a first-person pain report to express both types of information. However, the fact that these features are conveyed in seemingly all ordinary uses does not provide sufficient evidence that they are *semantically entailed* because implications can be communicated in three different ways by a target statement: they can be (i) semantically entailed, (ii) presupposed, (iii) or conversationally implicated.[3] For illustrative purposes using an example that is not related to pain, imagine that Tom says:

[3] In fact, there is a fourth way in which implications can be conveyed, namely by means of conventional implicatures. Conventional implicatures are typically considered to be part of the conventional meaning of the words that convey them while not being part of their truth-conditional meaning. We do not consider it plausible and are unaware of any suggestions that pain conventionally implicates bodily and/or feeling content.

[Target Statement] "I regret drinking instant coffee this morning"[4].

Let us further consider the following potential *implications*:

(a) Tom has a negative feeling about having drunk instant coffee.

(b) Tom drank instant coffee this morning.

(c) Tom prefers freshly-brewed coffee.

(d) Tom likes flowers.

Obviously, (d) cannot be inferred from the target statement and is therefore not an implication. However, (a) to (c) can be inferred.[5] Claim (a) partly expresses what is literally meant by Tom's statement; that is, (a) is *semantically entailed* by the target statement. Claim (b) does not express what is stated literally by Tom's statement, but rather what is presupposed by it. If Tom had not drunk instant coffee, it would not even make sense to say that he regretted drinking coffee. Finally, claim (c) neither expresses what is literally meant by Tom's statement nor what is presupposed; it is *conversationally implicated*. Depending on the context, this inference can be made, but the inference is beyond what has literally been said. Linguists have devised several tests to determine whether certain content is semantically entailed, presupposed, or conversationally implicated.

Implication Test. Before we can discuss how a piece of information is conveyed, we need to determine whether it has actually been conveyed at all. For example, the information "Tom likes flowers" cannot be inferred from the target statement. Therefore, it is not an implication of the utterance "I regret drinking instant coffee this morning". The implication test determines what pieces of information are implications of a target statement. For this purpose, people answer a simple question such as "From this statement alone and having no other information, what do you infer from this statement?" Semantically entailed, as well as presupposed content, should always be inferred by competent speakers who understand the meaning of the statement and the terms involved. Conversational implicatures are also often inferred, but the extent to which they are inferred depends on the strength of the conversational implicature. While particularized conversational implicatures depend strongly on context and thus are often less strongly inferred, generalized conversational implicatures are more strongly inferred due to their independence from the context.[6]

[4] We have borrowed this example verbatim from Väyrynen (2013, p. 60).

[5] Some scholars have denied that semantically entailed content is ever inferred. As semantically entailed content is conveyed at the level of what is said explicitly, there is no need for an additional inference. Our use of the term "inferred" is less technical and more colloquial, and is intended to mean "what one understands upon hearing the utterance".

[6] Consider the following two examples for illustration. The statement "There is a gas station around the corner" might convey various particularized conversational implicatures, such as "You should be able to get gas there" or "That's where the nearest bathroom is". By contrast, the statement "I have two children" always triggers the generalized conversational implicature that the speaker has precisely two children. We believe that, if feeling or bodily features are

Projection Test. The projection test helps to determine whether an implication is semantically entailed or is presupposed (Chierchia & McConnell-Ginet, 2000; Huang, 2006; Levinson, 1983) by embedding the target statement in an entailment-canceling operator, such as a negation. Here is an example:

[Target Statement] "I regret drinking instant coffee this morning".

[Negation] "I do not regret drinking instant coffee this morning".

The entailment-canceling operator does precisely what the name suggests: It cancels the semantically entailed implication. If Tom negates that he regrets drinking instant coffee, he certainly no longer conveys the information that he has a negative feeling about it. The presupposed content, namely that he drank coffee in the morning, survives. Regardless of whether or not Tom regrets drinking instant coffee, we can still infer that he must have drunk coffee.

Deniability Test. Finally, we can distinguish semantically entailed and presupposed content from conversationally implicated content by running the deniability test. In the deniability test, participants are asked how contradictory it sounds to deny or cancel certain content (Reins & Wiegmann, 2021). Conversationally implicated content can be denied. If Tom were to say "I regret drinking instant coffee this morning" but then denies that he prefers freshly-brewed coffee, he would not contradict himself. By contrast, if Tom said "I regret drinking instant coffee this morning" but denied that he has a negative feeling about drinking instant coffee, his statement would be indeed contradictory.

Note that the deniability test is closely related to the more common cancelability test (Davis, 2019; Grice, 1975; Zakkou, 2018). The cancelability test asks whether an original statement that triggers an implication can be combined with the immediate and explicit denial of that implication; for example, "This is round, but I do not mean to say that it has no edges". This test has been applied successfully in different experimental studies (Almeida et al., 2021; Baumgartner et al., 2022 a, b; Muth et al., 2020; Sytsma et al., ms; Willemsen & Reuter, 2021). The deniability test also investigates whether the speaker can take back an implication, but it does so in more elaborate conversational settings (see the experimental design in Section 4, as well as Reins & Wiegmann, 2021). For the purpose of experimental studies, the deniability test usually provides a more natural conversational context, such as in communication between patients and medical professionals, which we have indicated as being central to the understanding of the folk concept of pain.

As indicated in Table 1, combining these three traditional linguistic tests provides a checklist to identify semantically entailed content, presupposed content, and conversationally implicated

conveyed as conversational implicatures of pain reports, these cases should function as generalized conversational implicatures.

content. A piece of information will be categorized as being semantically entailed only if the following conditions are fulfilled: (i) the content is inferred from the target statement (implication test), (ii) the content does not project under an entailment-canceling operator (projection test), and (iii) the content is not deniable (deniability test).

Table 1 *: Prediction for Implication, Projection, and Deniability for Semantic Entailment (SE), Presupposition (Presup), and Conversational Implicature (CI)*

	Implication	Projection	Deniability
Semantic Entailment (SE)	☑	☒	☒
Presupposition (Presup)	☑	☑	☒
Conversational Implicature (CI)	☑	☑/☒	☑

Based on this, we can return to the first-person pain report "I have a pain in my arm" as our target statement. The implication, projection, and deniability tests, should allow us to determine whether the feeling, bodily, or pluralist views are better supported by empirical data. To do so, we need to define different types of content that map onto the respective feeling and bodily aspects that in question. We suggest the following three target contents:

Body1: There is something physically wrong with Tom's arm.

Body2: Tom thinks that there is something physically wrong with his arm.

Feeling: Tom feels something unpleasant.

The exact phrasing of all three target contents is, of course, debatable. We decided to employ a commonly accepted characterization of the mental aspect as an unpleasant feeling and a suitably general description of the bodily aspect as there being something physically wrong with the respective body part (see Section 2). We tested the bodily condition in two ways, *Body1* and *Body2*, to ensure that both objective information about the body's state and subjective information about the speaker's thoughts about their body's state were considered. In the statement "I have pain in my arm", the speaker could (in principle) communicate that their body is in a disruptive state or that they believe this to be the case.

We are now in a position to state the predictions that the bodily, feeling, and pluralist views would make with regard to the first-person pain statement "I have a pain in my arm".

Bodily View: Whereas *Body1* (and *Body2*) is semantically entailed, *Feeling* is (at best) conversationally implicated by the target statement "I have a pain in my arm".

Feeling View: Whereas *Feeling* is semantically entailed, *Body1* (and *Body2*) is (at best) conversationally implicated by the target statement "I have a pain in my arm".

Pluralist View: Both *Body1* (and *Body2*) and *Feeling* are semantically entailed by the target statement "I have a pain in my arm". [7]

As the implication and projection tests are closely related, we decided to run them together in one experiment, the results of which we present in Section 4. The results of the deniability test are presented separately in Section 5. To ensure that the experiments were well designed, we included the regret condition as a control condition.

4. Study 1: Implication and Projection

Our new experimental approach applies traditional linguistic tests to study the semantics of first-person pain reports. Instead of presenting participants with vignette-based stimuli that are prone to various contextual biases, we presented the participants with a single-sentence stimulus, "I have a pain in my arm". This enabled us to focus on natural conversational contexts in which people ascribed pain to themselves and reported this judgment to others instead of asking participants to determine whether an agent had pain from a third-person perspective. The aim of Study 1 was two-fold. First, we examined whether various potential implications that might be triggered by a pain statement were inferred in a positive embedding. Second, we tested which of these implications were retained in a negative embedding; that is, under negation.

4.1 Methods

We implemented a 2 × 2 × 6 mixed design with the between-subject factors embedding (positive, negative) and concept (pain, regret), and the within-subject factor implication. We first presented the participants with a single-sentence stimulus. In the pain condition, the participants read one of the following two statements:

Pain Positive: "I have a pain in my arm".

Pain Negative: "I don't have a pain in my arm".

In the regret condition, the participants were presented with one of the following two statements:

[7] Different versions of the pluralist view will express different assumptions concerning how information about a feeling or body state is communicated, even if they may all agree that these aspects are part of the semantic content of the folk concept of pain. For the sake of simplicity, we will ignore these subtleties concerning the different interpretations of the pluralist view in the following, and will revisit them in more detail in the general discussion.

Regret Positive: "I regret drinking instant coffee this morning".

Regret Negative: "I don't regret drinking instant coffee this morning".

The positive embeddings (*Pain Positive* and *Regret Positive*) were used in the implication test to determine the content that could be calculated based on the original pain or regret statement. The negative embeddings (*Pain Negative* and *Regret Negative*) were used in the projection test to investigate projection behavior and to thus differentiate content that was presupposed from that which was not. All the participants were then presented with the following prompt:

Question "From this statement alone and having no other information, what do you infer from this statement?"

The participants indicated their agreement on a 9-point Likert scale ranging from "1 = cannot be inferred" to "9 = can be inferred with certainty". In the embeddings for the pain condition (*Pain Positive* and *Pain Negative*), subjects were presented with the following statements in randomized order:

Body1: There is something physically wrong with Tom's arm.

Body2: Tom thinks that there is something physically wrong with his arm.

Feeling: Tom feels something unpleasant.

CI_Pain: Tom needs help.

Presup_Pain: Tom has an arm.

Unrelated: Tom likes flowers.

In the regret condition (*Regret Positive* and *Regret Negative*), the subjects were presented with the following statements in randomized order:

Neg_Feeling: Tom has a negative feeling about drinking instant coffee this morning.

Wish: Tom wishes he had not drunk instant coffee this morning.

CI_Regret: Tom prefers freshly-brewed coffee.

Presup_Regret: Tom drank instant coffee this morning.

Unrelated: Tom likes flowers.

Body1, *Body2*, and *Feeling* were the target contents that were used to test the plausibility of the bodily view, the feeling view, and the pluralist view regarding the folk concept of pain. *Neg_Feeling* and *Wish* functioned as contents that were likely to be semantically entailed by the regret statement, which enabled us to evaluate whether our experiments were designed in such a way that enabled us to identify the semantic features of a target statement. *Unrelated* functions in the pain and regret

conditions served as a control for the implication test to exclude content that was not inferred. *Presup_Pain* and *Presup_Regret* were likely to be presupposed by the target statement. In contrast to the semantically entailed content, they should survive in the projection test. *CI_Pain* and *CI_Regret* are inferences that could be made based on the respective target statements, but which are inferred beyond what is literally said. Accordingly, it should be possible to deny them without producing a contradiction. These conversational implicatures will be the focus of the deniability test in Section 5.

4.2 Preregistered Hypotheses

Based on some pilot studies, we preregistered the following hypotheses for the implication and projection tests:

H1: For the contents *Body1*, *Body2*, and *Feeling*, as well as *Neg_Feeling* and *Wish*, the ratings are significantly above the midpoint of 5 for the positive embeddings and significantly below the midpoint for the negative embeddings.

H2: For the contents *Presup_Pain* and *Presup_Regret*, the ratings are significantly above the midpoint of 5 for both positive and negative embeddings.

H3: For *Unrelated*, the ratings are significantly below the midpoint of 5 for both positive and negative embeddings in the pain and regret condition.

All the hypotheses, tests, and exclusion criteria were preregistered. 262 participants were recruited via Prolific and completed an online survey implemented using Qualtrics. All the participants were required to be at least 18 years of age, native English speakers (or bilingual), and to have an approval rate of at least 95%. The participants had an average age of 38.47 years, and the gender distribution in the sample was 115 males, 141 females, and six non-binary persons.

4.3 Results

The results of the implication and projection tests for all conditions can be found in Table 2 (*Pain Positive* and *Pain Negative*) and Table 3 (*Regret Positive* and *Regret Negative*).

Table 2: *Implication and Projection Tests for Pain Positive (Upper Part) and Pain Negative (Lower Part)*

Condition	Mean	Std Err	*t*	*p*-value
Body1	6.22	0.291	4.210	< 0.001
Body2	6.94	0.258	7.528	< 0.001
Feeling	8.19	0.149	21.403	< 0.001
CI_Pain	5.84	0.260	3.213	= 0.002
Presup_Pain	8.90	0.043	90.086	< 0.001
Unrelated	1.31	0.161	-22.918	< 0.001
Body1	3.03	0.304	-6.486	< 0.001
Body2	2.97	0.301	-6.733	< 0.001
Feeling	3.12	0.331	-5.690	< 0.001
CI_Pain	2.91	0.307	-6.801	< 0.001
Presup_Pain	8.33	0.186	17.907	< 0.001
Unrelated	1.55	0.218	-15.800	< 0.001

Table 3: *Implication and Projection Test for Regret Positive (Upper Part) and Regret Negative (Lower Part).*

Condition	Mean	Std Err	*t*	*p*-value
Neg_Feeling	8.10	0.213	14.588	< 0.001
Wish	8.04	0.227	13.443	< 0.001
CI_Regret	4.22	0.318	-2.439	= 0.017
Presup_Regret	8.66	0.145	25.201	< 0.001
Unrelated	1.90	0.272	-11.429	< 0.001
Neg_Feeling	2.06	0.233	-12.592	< 0.001
Wish	1.83	0.221	-14.341	< 0.001
CI_Regret	3.20	0.302	-5.961	< 0.001
Presup_Regret	8.61	0.156	23.187	< 0.001
Unrelated	1.42	0.186	-19.244	< 0.001

We ran one-sample *t*-tests to investigate whether the means differed significantly from the midpoint of 5. Our results confirmed **H1**: All five statements (*Body1*, *Body2*, *Feeling*, *Neg_Feeling*, and *Wish*) received ratings that were significantly above the midpoint for the positive embedding and below the midpoint for the negative embedding. The two presuppositions (*Presup_Pain* and *Presup_Regret*) received ratings above the midpoint for the positive and negative claims, thus providing strong evidence for **H2**. The ratings for the unrelated statement were below the midpoint for both embeddings in the pain and regret conditions, thus supporting **H3**.

4.4 Discussion

In the pain condition, we investigated three candidates (*Body1*, *Body2*, and *Feeling*) as being potentially communicated by means of semantic entailment. The data suggest that bodily (*Body1* and *Body2*) and feeling aspects (*Feeling*) were implicated but not presupposed by the claim "I have a pain in my arm" because they did not project under negation. Furthermore, the putatively presupposed content (*Presup_Pain*) was rated as expected: In the positive and negative embeddings,

the participants assumed that Tom had an arm in order to make sense of the target statement. Minor differences in the ratings for the positive and negative embeddings could be explained by experimental-pragmatic factors. *Unrelated* content was not implicated by the pain statement. Although we did not make hypotheses concerning the putatively conversationally implicated content (*CI_Pain*), it should be noted that it received ratings above the midpoint for the positive condition, although not significantly so, and ratings that were significantly below the midpoint in the negative conditions. The regret condition functioned as expected.

5. Study 2: Deniability

In Study 1, it was found that body and feeling features were implications of first-person pain reports that were not presupposed. Together with the conversational implicature, these conditions were transferred to Study 2. We did not include the presupposed contents (*Presup_Pain* and *Presup_Regret*) and unrelated content (*Unrelated*) from Study 1 because the previously presented results had determined their identities. Thus, Study 2 used a variation of the cancelability test, which is also known as the deniability test. We adapted the paradigm by creating a new version of Reins and Wiegmann's (2021) deniability test. The deniability paradigm is particularly useful because it is discursive, as two speakers are involved. This is a natural context for the investigation of pain, as it is the type of communicational situation in which patients and doctors are involved.

5.1 Methods

We implemented a 7 × 1 between-subjects design with implication as a between-subjects factor. The following two examples illustrate the design of the vignettes.[8]

Neg_Feeling (Regret)

Tom says to Sally:	"I regret drinking instant coffee this morning."
Sally responds:	"Oh, so you mean that you have a negative feeling about drinking instant coffee this morning."
Tom responds:	"No, I don't mean to say that. I have a positive feeling about drinking instant coffee this morning."

Feeling (Pain)

Tom says to Sally:	"I have a pain in my arm."
Sally responds:	"Oh, so you mean that you're feeling something unpleasant in your arm?"

[8] The conversations for all the stimuli can be found in this online repository.

Tom responds: "No, I don't mean to say that. My arm feels perfectly fine."

The participants were randomly presented with one of seven different conversations related to *Body1*, *Body2*, *Feeling*, *CI_Pain*, *Neg_Feeling*, *Wish*, and *CI_Regret*. Please note that we use the same labels in Study 2 as in Study 1 because they tested for the same content, albeit using different stimuli. The participants were then asked the question "Does Tom contradict himself?" The participants answered using a 9-point Likert scale ranging from "1 = definitely not" to "9 = definitely yes".

5.2 Hypotheses

We investigated the following hypotheses:

H4: The content of *Body1*, *Body2*, and *Feeling*, as well as the content of *Neg_Feeling* and *Wish*, receive contradiction ratings that are significantly above the midpoint of 5.

H5: The content of *CI_Pain* and *CI_Regret* receive contradiction ratings that are significantly below the midpoint of 5.

All the hypotheses, tests, and exclusion criteria were preregistered. Prior to the tests, the participants were given a short description of what it means for speakers to contradict themselves in the philosophically relevant sense. They then answered two test questions that served as comprehension checks. We excluded two participants who failed both of these test questions. The remaining 408 participants had a mean age of 38.75 years, with 107 indicating male, 295 female, and six non-binary gender.

5.3 Results

The mean ratings and statistical results for each of the seven conversations are listed in Table 4 and illustrated in Figure 1. We conducted *t*-tests to examine the conversations for which the contradiction ratings were significantly above the midpoint of 5. Except for *Body2*, **H4** was supported for all conditions for which we expected high contradiction ratings. Providing evidence for **H5**, both conversational implicature conditions were significantly below the midpoint of 5.

Table 4: *Data for the Deniability Study for the Seven Contents Tested*

Concept	Condition	Mean	Std Err	*t*	*p*-value
Pain	Body1	5.95	0.395	2.405	= 0.010
	Body2	5.56	0.383	1.460	= 0.075
	Feeling	7.27	0.286	7.945	< 0.001
	CI_Pain	1.22	0.065	-57.846	< 0.001
Regret	Neg_Feeling	6.49	0.354	4.214	< 0.001
	Wish	7.74	0.287	9.534	< 0.001
	CI_Regret	2.11	0.280	-10.357	< 0.001

5.4 Discussion

In the pain condition, *Body1* and *Feeling* received ratings that were significantly above the midpoint, thus suggesting that both contents were semantically entailed by the claim "I have a pain in my arm". While we do not have a completely satisfactory explanation for why the ratings for *Body2* were slightly decreased, it is possible that the precise wording of the condition had a negative effect on people's ratings (see Section 6 for a more detailed discussion). Finally, *CI_Pain* received low contradiction ratings, thus indicating that its content was only conversationally implicated. The regret condition functioned as expected. The contents of *Neg_Feeling* and *Wish* were considered to be semantically entailed by the regret statement, whereas the content of *CI_Regret* appeared to be only conversationally implicated given the low contradiction ratings for the respective conversations.

6. General Discussion

6.1 Summary of the Results

Our investigation aimed to better understand the folk concept of pain using a new methodological approach based on pain linguistics. One of the central questions in the philosophy of pain is what the semantic features of the folk concept of pain are. Three suggestions have been made in the literature: The first is that the semantic content mainly pertains to a feeling (feeling view), the second is that it mainly pertains to a bodily state (bodily view), and the third is that it includes both feeling and bodily information (pluralist view). To distinguish among these three options experimentally, we focused on first-person pain reports using the implication, projection, and deniability tests.

The results of Study 1 and Study 2 indicated that both information about a bodily state (*Body1* and *Body2*) and an unpleasant feeling (*Feeling*) met our criteria for semantic entailment, as depicted in Table 5. First, the information that there is something wrong with Tom's arm, that Tom thinks that there is something wrong with his arm, and that Tom has an unpleasant feeling was reliably

inferred from Tom's statement, "I have a pain in my arm". Second, these three implications did not project when embedded in an entailment-canceling operator. The participants no longer inferred a bodily or feeling component when Tom said "I don't have a pain in my arm". Third, the target contents cannot be denied when a first-person pain report is made without producing a contradiction. At the same time, the intuitively unrelated, presupposed, and conversationally implicated contents behaved as expected in relation to the target statement "I have a pain in my arm".

Table 5: *Implication Test, Projection Test, and Deniability Test for the Statement "I have a pain in my arm"*

	Implication	Projection	Deniability
Body1	☑	☒	☒
Body2	☑	☒	☒
Feeling	☑	☒	☒
Unrelated	☒		
Presup_Pain	☑	☑	
CI_Pain	☑	☒	☑

These results allowed us to draw two conclusions about our research. First, we provide with some methodological remarks (Section 6.2). Second, we locate our research in a larger perspective to show that it favors a pluralist view, while not all of its variants were compatible with the combined results of the vignette-based and our experimental-linguistic studies (Section 6.3).

6.2 Methodological Limitations

Our investigations revealed that well-established linguistic tests, namely the implication, projection, and deniability tests, proved to be useful in their application to first-person pain reports. The regret condition that served as our control confirmed that the experiments were well designed. We consider this to be an innovative shift in the methodological access to the current philosophical debate that can assist in the identification of aspects of the folk concept of pain that have been unnoticed thus far. Therefore, pain linguistics can provide new insights into ordinary pain language. While we consider our experimental framework to be promising, we would also like to discuss four potential limitations.

First, our methodological approach allowed us to avoid the (lack of) competence and performance effects that may alter people's responses in vignette-based studies. However, first-person pain reports may also provoke certain biases. While the presentation of first-person pain reports was relatively context-free in our studies, the participants may have already had a particular context in which the corresponding statements typically occur in mind. Our design cannot reveal the context that the participants imagined when reading the target statement "I have a pain in my

arm". Nonetheless, in the absence of further contextual information, we assume that, in general, our experimental framework triggered thoughts about a broad array of conversational situations we aimed to test.

Second, one might question whether the suggested experimental design is, in principle, sufficiently demanding and does not include the danger that our semantic entailment criteria can be met too easily. For example, one might question whether a rating above the mid-point in the implication test is sufficient to establish that content is reliably inferred. Similarly, one might question whether a rating above the midpoint in the deniability test is sufficient to establish that a target content cannot be denied without producing a contradiction. Previous studies that have used the cancelability or deniability tests (see e.g., Willemsen & Reuter, 2021 on thick concepts) have revealed that average results between 6 and 7 were extremely common for semantically entailed content, and thus reliably indicated such a semantic component. Results between 7 and 9 were rare, presumably because many participants shied away from the endpoints of a scale, the statements that are used in cancelability and deniability tasks are not always easy to comprehend, and some participants had unusual interpretations of terms; for example, they denied that lakes necessarily consisted of water because they were thinking about lava lakes.

Third, although we might be justified in claiming that both bodily and feeling aspects are semantically entailed components, the differences in the ratings for *Body1* (5.95), *Body2* (5.56), and *Feeling* (7.27) in the deniability test require further explanation. There might be two potential reasons for why *Body1* and *Body2* were treated in this manner. First, one potential reason was the particular wording of the bodily conditions. To say that there is something physically wrong with a body part is likely to communicate a certain type of severity that not everyone associates with a damaged, disturbed, or disrupted body state (Liu, 2020). For example, some participants might understand Tom's statement "I have a pain in my arm" as referring to a bodily state that is not considered to be as serious as the expression "physically wrong" would suggest. Similarly, not all pains indicate "wrongness", as having sore muscles after exercising might actually be considered exactly how one's body *should* feel. Second, our experimental design is most likely to be appropriate for prototypical pain cases. However, it might encounter problems with cases of referred pain in which the location of a disturbance and the felt location are dissociated. Patients suffering from a heart attack or spinal disc herniation often report pain in their arms, even though their arms are perfectly fine. Our two target contents for bodily aspects might be inadequately formulated to address pains of this type. Furthermore, the decreased ratings for *Body2* might be related to the more complex description of the condition, thus negatively affecting the contradiction ratings.

Finally, we would like to address the question regarding the compatibility of the results of vignette-based research and our experiments. As stated above, many vignette-based studies have

yielded results that support unitary views (e.g., Reuter & Sytsma, 2020). It is important to note that many vignette studies were designed in such a way that feeling and bodily views were pitted against each other. Thus, the participants' responses would either speak against the bodily view, or against the feeling view. Such studies can and do reveal important insights into people's thoughts about pain but, as we have argued above, they might also predispose people to provide certain answers due to the frequently unusual contexts and designs. Thus, this might also reveal that different factors activate different conceptions in our thinking of pain. One of the most obvious factors is, of course, the first-person communicative act that was at the center of our investigation. Such a communicative act might introduce confounding factors such as charitable interpretations on part of the listener for which we were not able to control. Examining such factors was beyond the scope of our paper, but should be included in future studies.

Overall, we need to remain cautious about whether our three tests can jointly prove what constitutes part of the semantic content of the folk concept of pain. In our opinion, this does not generally speak against our experimental framework but underlines the complexity of the folk concept of pain and the methodological ingenuity needed for its investigation. As indicated in Section 2, we need a new methodological approach to the folk concept of pain that captures the linguistic intuitions of participants in as natural a context as possible. Focusing on pain linguistics enables us to go beyond previous vignette-based studies. Naturally, this approach also has certain methodological limitations. Therefore, we consider vignette studies and our experimental-linguistic design to complement one another.

6.3 Theoretical Implications

The results of our studies might seem to provide positive outlooks for the bodily view and for the feeling view, as bodily and feeling components appeared to be semantically entailed in first-person pain statements. However, both views seem to tell only half of the story. By contrast, the pluralist view is more commensurate with the results of our studies. Information regarding both a bodily disruption and an unpleasant feeling appears to be communicated as part of the semantic content of the folk concept of pain in first-person pain reports. This suggests that the folk concept of pain is indeed complex. That is, the paradox of pain cannot be solved by denying that one of the two features is part of the semantic content of the folk concept of pain, as suggested by unitary views. Instead, a pluralist view acknowledges the complexity of the semantic features, thus rejecting the assumption of a (single) folk concept of pain with a univocal meaning.

As indicated in Section 2, pluralist accounts take multiple forms. In particular, they differ in how they characterize the relationship between feeling and bodily features as part of the semantic content of the folk concept of pain. It is likely that not all pluralistic approaches will be compatible

with the combined results of previous vignette-based and our experimental-linguistic studies. Therefore, the different pluralistic approaches deserve closer examination focusing on the polyeidic, polysemous, and component views as the most prominent pluralistic approaches defended in the recent literature.

Borg et al. (2019, 2020) defended a polyeidic view, which posits a single folk concept of pain that is understood as an amalgam of multiple dimensions. One of these dimensions has mental and bodily aspects as its opposite end points. The polyeidic view allows some people to tend toward the mental end point of the dimension and others to tend toward the bodily end point. Furthermore, the polyeidic view allows the same person to treat pain as a mental state in one context and as a bodily state in another. Central to the polyeidic view is its dimensional character: Based on contextual and individual differences, people may tend toward one or the other direction of the spectrum (Borg et al., 2021). However, according to the polyeidic view, the same person cannot treat pain in the same situation as an unpleasant feeling and a disruptive bodily state:

> To return to the question of whether the Polyeidic view is committed to maintaining that the folk view of pain is paradoxical: this version of the view would seem to allow that it was not, since no experience of pain would ever be conceptualized as, for example, both entirely mental or entirely bodily at one and the same time (Borg et al., 2020, p. 44)

The polyeidic view encounters at least three challenges. First, it predicts that the same person can have radically inconsistent beliefs about what pain is in different contexts, which seems to be in contrast which how most of our folk concepts work (Liu, 2021b). Second, the distinction of treating pain as a bodily or mental state appears to be categorical rather than dimensional; this is in contrast to some of the other properties included in the amalgam of dimensions (for example, sensory, affective, and motivational), which may well be modeled as having different degrees (Coninx, 2022). Third, and most relevant for the present purposes, the polyeidic view appears to contradict the results of our implication test. The same participants infer feeling and bodily information from first-person pain reports at the same time. To account for these data, feeling and bodily features cannot be modeled as located at the opposite ends of the same dimension. Instead, we need an account that predicts that people will treat pain as simultaneously involving feeling and bodily aspects, at least in ordinary cases.

Liu (2021b, 2021a) defended a polysemy view. Most views that have been defended in the recent literature presuppose that there is only a single folk concept of pain that has either a univocal or a more complex meaning. By contrast, the polysemy view suggests that there are two distinct folk concepts of pain with univocal, although related, meanings: One that treats pain as a mental state and one that treats pain as a bodily state. Thus, the polysemy view assumes that there are two related folk concepts of pain. Furthermore, in principle, it allows for these two concepts to be

employed simultaneously. Accordingly, the polysemy view is compatible with the empirical findings provided thus far. However, whether it is indeed plausible to assume the existence of two separate concepts associated with the term "pain", given that they are systematically derived together as indicated by our experiments, remains to be discussed.

Third, the component view presupposes a single folk concept of pain that is composed of multiple elements: The folk concept of pain includes both feeling as well as bodily aspects. In principle, there are strong and weak versions of the component view. Defenders of a strong version assume that information about a disruptive bodily state and an unpleasant feeling are necessary components of the semantic content. In this version, the results of existing vignette studies remain to be explained. By contrast, defenders of a weak version of the component view (e.g. Corns, 2020) may admit that people also ascribe pain in the absence of one of these two components in exceptional cases, even if these cases are likely to be perceived as less paradigmatic. Thus, this approach reveals strong ties to family resemblance (Wittgenstein, 1958) or prototype theories (Rosch & Mervis, 1975). The challenge here is to examine the conditions under which an attribution of pain still takes place and which cases are considered more or less pragmatic in greater detail.

To summarize, pain linguistics provides a new methodological approach to the folk concept of pain that circumvents the limitations of vignette studies and thus complements them in a useful way. The results of our studies allowed us to identify pluralist views as being more promising than unitary views. Our three tests clearly indicated that the feeling and bodily content behaved more like semantic entailments than presuppositions and conversational implicatures. Therefore, the assumption that types of feeling and bodily information are semantic features of the folk concept of pain constitutes the conclusion regarding the best explanation to date. This is revealed in the most frequent and most relevant use of the folk concept of pain in conversational settings, namely first-person pain reports. Our studies make yet another theoretical contribution, as only the polysemy and component views are compatible with our results. In particular, the component view deserves further investigation, as it has not yet been sufficiently considered in recent debates.

Finally, does the acceptance of a pluralistic view indicate that the folk concept of pain is indeed paradoxical? Not necessarily. According to the component view, one might argue that the folk concept of pain refers to a more complex episode composed of bodily and feeling aspects that are expected to occur together. There is not necessarily something paradoxical about this concept.

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