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# An Experimental-Linguistic Study of the Folk Concept of Pain: Implication, Projection, & Deniability

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## Abstract

The last ten years have seen a steady increase in vignette-based research investigating the folk concept of pain. That research challenges the standard view of pain, according to which pains are unpleasant feelings. However, the results of these studies also suggest that the concept of pain is ambiguous and difficult to pin down. This paper approaches the topic from a new angle, using linguistic tests to decipher what people communicate when making statements such as 'I have a pain in my arm'. The results suggest that first-person pain reports semantically entail information about both an unpleasant feeling and a disruptive bodily state. This speaks in favor of a pluralist view on the semantic meaning of pain.

**Keywords:** folk concept of pain; bodily states; feeling pain; pluralist view; deniability test; projection test

## 1. Introduction

The concept of pain seems paradoxical as it points in two mutually exclusive directions (Hill, 2006). On the one hand, the standard view in both the medical sciences and philosophy claims that pain is an "unpleasant sensory and emotional experience" (Raja et al., 2020), i.e., a *feeling* that is private and subjective (Aydede, 2009; Tye, 2005). On the other hand, we seem to treat pains as *bodily states* such as bodily disruptions that are commonly considered public and objective (Kim et al., 2016; Massin, 2017; Reuter, Phillips, & Sytsma, 2014; Reuter & Sytsma, 2020). Given that these two conceptions of pain are commonly taken to exclude each other, scholars disagree about how to define the concept of pain for further philosophical investigations (Coninx, 2020; Corns, 2020).

Most definitions of pain aim to capture the *folk concept of pain*. Thus, it seems vital to collect empirical data on what laypeople mean when using the term 'pain'. *Vignette-based experiments* have been increasingly used to study the folk concept of pain (e.g., Reuter et al., 2014; Reuter & Sytsma, 2020; Salomons et al., 2021; Sytsma, 2010). Several of these studies have challenged the *Feeling View*, according to which the folk concept of pain refers to a subjective experience. One direct consequence of that view is that pains cannot exist unfelt. However, participants in empirical studies seem willing to ascribe unfelt pains to people (Sytsma, 2010). For example, a majority of people believe a wounded soldier to have a pain even if he does not feel any pain (Reuter & Sytsma, 2020). These results support the *Bodily View* – the view that the concept of pain denotes a bodily state. According to this view, a person cannot have a pain without their body being disrupted, disturbed, or damaged, irrespective of whether they feel such bodily state. Other studies, however, seem to challenge the Bodily View: participants are willing to ascribe pain in scenarios in which people feel pain in the absence of a corresponding bodily state. For example, a majority of people believe a person to have pain when they report feeling pain after direct stimulation of their brain without any (non-brain) bodily changes taking place (Salomons et al., 2021).

While vignette-based studies constitute the most prominent method to investigate the folk concept of pain[1], they face two limitations. First, existent vignette-based studies largely neglect the first-person perspective. Instead, most vignettes describe scenarios in which pain is ascribed to a third person. This focus fails to account for the intuitively most frequent and most relevant uses of pain terms in which people attribute pains to themselves and express this judgment to others. A better understanding of the use of the folk concept of pain in this context proves most crucial, as first-person pain reports are especially important in the communication between patients and medical professionals (Salomons et al., 2021; Goldberg et al., 2022).

Second, vignette studies are designed to decide between the Feeling and the Bodily View. Therefore, the vignettes describe situations that appear rather unusual, namely a person with heavy bodily damage but no experience of pain, or a person who is feeling pain but has no bodily disruption. In our ordinary life, these things are expected to go together. Testing such extreme cases and pulling apart properties that usually go together in everyday life has been argued to disrupt people's competence in applying even familiar concepts (Machery, 2017). Thus, the contextualization of the

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[1] While vignette-based studies have dominated the empirical investigation of the folk concept of pain, there are also corpus-based studies on pain reports (e.g., Lascaratou, 2007; Reuter, 2011; Sytsma & Reuter, 2017). Further, Michelle Liu (2021b) uses linguistic methods to test for the ambiguity of pain-related words such as 'sore', 'aching', and 'hurting'.

vignettes may strongly bias people's responses and shift them in the direction of the Bodily or the Feeling View respectively (Borg et al., 2020).

We believe that a new experimental approach is needed to identify the contributions of feeling and bodily aspects to the folk concept of pain. This paper uses *three linguistic tests* to examine what people communicate when making *first-person pain reports*, such as 'I have a pain in my arm.' In Section 2, we explain these linguistic tests in greater detail. Section 3 reports the results of an experiment (N=262) using the *Implication* and *Projection Test*, while Section 4 delivers the results of a study (N=408) using the *Deniability Test*. In Section 5, we discuss the limitations of our study and compare our results with the existing data on the folk concept of pain. Taken together, our results point to a Pluralistic View of pain.

## 2. An Experimental-Linguistic Approach

The debate on the folk concept of pain primarily revolves around the question of what the *semantic content* of the concept of pain is. A promising starting point to understand the semantic content of a term is to examine what the term communicates when uttered. We can distinguish at least *three different kinds* of content that can be communicated: (i) semantically entailed content; (ii) presupposed content; (iii) conversationally implicated content. Suppose, for instance, that Tom says 'I regret drinking instant coffee this morning'[2]. Let us further consider the following three claims:

(a) Tom has a negative feeling about having drunk instant coffee.
(b) Tom drank instant coffee this morning.
(c) Tom prefers freshly-brewed coffee.

While all three claims might be inferred by Tom's statement, these inferences are different in kind. Claim (a) expresses (at least in part) what is meant by Tom's statement and thus it is *semantically entailed* by it. Claim (b) does not express what is literally said by Tom's statement, but rather what is *presupposed* by it. If Tom hadn't drunk instant coffee, it would not even make sense to say that he regrets drinking coffee. Finally, claim (c) neither expresses what is literally meant by Tom's statement, nor what is presupposed to make sense of the statement. Rather, it is *conversationally implicated*. This inference can be made, depending on the context, but it is inferred beyond what is literally said.

Linguists have devised tests to determine whether a certain content, hereafter *target content*, is semantically entailed, presupposed, or conversationally implicated. To make such a determination, we need to run three tests. These are the *Implication*, *Projection*, and *Deniability Tests*.

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) | ☑/☒ | ☑/☒ | ☑ |

First, we need to find out, whether a certain claim can be inferred at all and is, thus, an implication. Of course, many claims, e.g., 'Tom likes flowers', cannot be inferred from Tom's original statement. The *Implication Test* simply asks people whether a certain content can be inferred from the original statement (Grice, 1975; see also, Blome-Tillmann, 2013). Both, semantically entailed as well as presupposed target content should always be inferred by competent speakers who understand the meaning of the statement and terms involved. Conversational implicatures, on the other hand, only have the *disposition* of being inferred. Depending on the context and assumptions about the speaker's intentions, they are more or less likely to be inferred.

Second, to determine whether the target content is semantically entailed or instead presupposed, we need to run the *Projection Test* (e.g., Levinson, 1983; Chierchia & McConnell-Giet, 2000; Huang, 2006). The Projection Test asks people whether a certain content can be inferred when the original statement is embedded in an entailment canceling operator, such as negation. For example, if a certain target content is presupposed by Tom's statement, then people should also infer that content when the initial statement is negated. From 'I don't regret drinking instant coffee this morning', we can still infer 'Tom drank instant coffee this morning', whereas 'Tom has a negative feeling about having drunk instant coffee' certainly can no longer be inferred.

Finally, we can distinguish semantically entailed and presupposed content from conversationally implicated content by running the *Deniability* Test[3]. In the Deniability Test, participants are asked how contradictory it sounds to deny or cancel the target content (for an application of this test, see e.g., 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 does not contradict himself. In contrast, if Tom says: 'I regret drinking instant coffee this

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[2] We owe this example to Pekka Väyrynen (2013, p. 60).

[3] A more common test is called Cancellability Test and goes back to Grice (1975; see also Davis, 2019; Zakkou, 2018). The Cancellability Test asks whether an original statement, triggering an implication, can be combined with the immediate and explicit denial of that implication, e.g., 'This is round, but I do not mean to say that it has no edges.' For an application of this test in experimental

studies, see Almeida, Struchiner, & Hannikainen (2021), Baumgartner, Willemsen, & Reuter (2022), and Willemsen & Reuter (2021). The Deniability Test also investigates whether an implication can be taken back by the speaker but does so in more elaborate conversational settings (see the experimental design below). For the purpose of experimental studies, the Deniability Test usually provides a more natural conversational context.

morning' but denies that he has a negative feeling about drinking instant coffee, his statement is indeed contradictory. Table 1 summarizes these predictions.

In Section 1, we introduced the main positions in the debate on the meaning of the concept of pain. To investigate the apparently contrasting body and feeling components, we phrased the target contents as follows:

*Body1*:   There is something physically wrong with Tom's arm.
*Body2*:   Tom thinks that there is something physically wrong with his arm.[4]
*Feeling*:   Tom feels something unpleasant.[5]

We are now in a position to state the predictions that the Bodily View and the Feeling View would make in regards to the first-person pain statement 'I have a pain in my arm'.

**Bodily View:** Whereas *Body1* (& *Body2*) is semantically entailed, *Feeling* is at most conversationally implicated by the pain statement.

**Feeling View:** Whereas *Feeling* is semantically entailed, *Body1* (& *Body2*) is at most conversationally implicated by the pain statement.

Given the accounts advocated by Borg et al. (2020), Liu (2021a, 2021b), or Corns (2020), we might also state a third possibility, although this possibility does not follow directly from these accounts.

**Pluralist View:** Both, *Body1* (& *Body2*) and *Feeling* are semantically entailed by the pain statement.

The three tests we discussed above, namely the Implication Test, Projection Test, and Deniability Tests can inform us which implications are in fact semantically entailed, and thus to investigate which of the three views is supported by these linguistic tests. As the Implication and Projection Test are closely related, we decided to run them together in one experiment, the results of which we now present. To make sure the experiments were well-designed, we included the regret condition as a control condition.

## 3.   Study 1: Implication and Projection

### 3.1. Methods and Hypotheses

In Study 1, we first presented participants with a single-sentence stimulus. In the pain condition, participants read one of the following two statements:

'I have a pain in my arm.' (*Pain Positive*)
'I don't have a pain in my arm.' (*Pain Negative*)

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

'I regret drinking instant coffee this morning.' (*Regret Positive*)
'I don't regret drinking instant coffee this morning.' (*Regret Negative*)

The positive embeddings were used to test which target contents are calculable by the original pain or regret statement. The negative embeddings were used to investigate projection behavior and thus distinguish target contents that are presupposed from those that are not (see Section 2). All participants were then presented with the following prompt: 'From this statement alone and having no other information, what do you infer from this statement?' Participants provided 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 target contents 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 *Regret Positive* and *Regret Negative*, 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.[6] |
| CI_Regret: | Tom prefers freshly-brewed coffee. |
| Presup_Regret: | Tom drank instant coffee this morning. |
| Unrelated: | Tom likes flowers. |

Based on some pilot studies, we pre-registered the following hypotheses:

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

**(H2)**   For the target contents *Presup_Pain* and *Presup_Regret*, ratings are significantly above the midpoint for both embeddings, positive and negative.

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[4] We tested the bodily condition in two ways 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 accounted for. With the statement 'I have pain in my arm', the speaker could be communicating both that their body is in a disruptive state, or that they believe this to be the case.

[5] The exact phrasing of the statements is, of course, debatable. Whereas *Feeling* seems to be simple and clear enough, there is little

agreement in the literature on which bodily state can be identified as the target content. We, therefore, decided to go with a suitably general description of a bodily disruption.

[6] Similar to the pain condition, we also tested two target contents (*Neg_Feeling* and *Wish*) that are likely to be semantically entailed by the regret statement.

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

No predictions were made for CI_Pain and CI_Regret as they come into focus in Study 2.[7]

262 participants were recruited via Prolific and completed an online survey implemented in Qualtrics. All participants were required to be at least 18 years old, English native speakers (or bilingual), and 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 male, 141 female, and 6 non-binary.

### 3.2. Results

The results of the Implication and Projection Test for all conditions can be found in Table 2 (pain condition) and Table 3 (regret condition).

Table 2: Implication and Projection Test for
*Pain Positive* (upper part) and *Pain Negative* (lower part).

| Condition | Mean | StdErr | 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 |

We ran one-sample t-tests to investigate whether the means were significantly different from the midpoint of '5'. Our results confirmed **H1**: All five statements (*Body1*, *Body2*, *Feeling*, *Neg_Feeling*, and *Wish*) received ratings significantly above the midpoint for the positive embedding and below the midpoint for the negative embedding. The two presupposition conditions (*Presup_Pain* and *Presup_Regret*) received ratings above the midpoint for the positive and negative claim, providing strong evidence for **H2**. The ratings for the unrelated statement were below the midpoint for both embeddings in the pain and regret condition, supporting **H3**.

The regret condition served as a control case to make sure our experiment was well-designed. The results demonstrate that (a) the putatively semantically entailed contents (*Neg_Feeling* and *Wish*) were indeed implicated but not presupposed; (b) the presupposed content (*Presup_Regret*) satisfied the conditions for being presupposed; and (c) the *Unrelated* content was neither implied by the positive nor the negative embedding. The mean result for the conversational implicature (*CI_Regret*) was higher than the unrelated content but lower than the midpoint.

Table 3: Implication and Projection Test for
*Regret Positive* (upper part) and *Regret Negative* (lower part).

| Condition | Mean | StdErr | 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 |

### 3.3. Discussion

In the pain condition, we investigated three candidates for semantically entailed content (*Body1*, *Body2*, *Feeling*). The data suggest that both a bodily component (*Body1, Body2*), as well as a feeling component (*Feeling*) are implicated, but not presupposed by the claim 'I have a pain in my arm.' Furthermore, presupposed content (*Presup_Pain*) was rated according to the conditions for being presupposed. *Unrelated* content was not inferred by the pain statement.

## 4. Study 2: Deniability

### 4.1. Methods and Hypotheses

This experiment uses a variation of the Cancellability Test, also known as the Deniability Test. We adapted the paradigm in the following way. We created a new version of the Deniability Test, already used in the literature by Reins and Wiegmann (2021). What is particularly useful about the deniability paradigm is that it is already discursive, with two speakers being involved. This is a context most natural to the investigation of pain, as it is the kind of communicational situation in which patients and doctors are involved. Here are two examples to illustrate the design of the vignettes.[8]

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."

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?"

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[7] All hypotheses and tests were preregistered: https://osf.io/6jsv5

[8] The conversations for all stimuli can be found in this online repository: https://osf.io/qckud/files/

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

After participants were randomly assigned to one of 7 different conversations,[9] they were then asked the question: 'Does Tom contradict himself?' Participants answered on a 9-point Likert scale from '1 = definitely not' to '9 = definitely yes'. We investigated the following hypotheses:[10]

**(H4)** The target contents from *Body1_C*, *Body2_C*, and *Feeling_C*, as well as the contents from *Neg_Feeling_C* and *Wish_C* receive contradictions ratings significantly above the midpoint of '5'.[11]

**(H5)** The contents from *CI_Pain_C* and *CI_Regret_C* receive contradiction ratings significantly below the midpoint of '5'.

We excluded two participants who failed both test questions. The remaining 408 participants had a mean age of 38.75 years with 107 indicating male, 295 female, and 6 non-binary gender.

### 4.2. Results

The mean ratings and statistical results for each of the 7 conversations are listed in Table 4 and illustrated in Figure 1. We conducted t-tests to examine for which conversations the contradiction ratings were significantly above the midpoint of '5'. Except for *Body2_C*, **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'.

The regret condition worked again as expected. The target contents from *Neg_Feeling_C* and *Wish_C* are considered to be semantically entailed by the regret statement, whereas the target content from *CI_Regret_C* seems only conversationally implicated, given the low contradiction ratings of the respective conversation.

Table 4: Data for Deniability Study for the seven target contents we tested.

| Condition | Mean | StdErr | t | p-value |
|---|---|---|---|---|
| Body1_C | 5.95 | 0.395 | 2.405 | = 0.010 |
| Body2_C | 5.56 | 0.383 | 1.460 | = 0.075 |
| Feeling_C | 7.27 | 0.286 | 7.945 | < 0.001 |
| CI_Pain_C | 1.22 | 0.065 | -57.846 | < 0.001 |
| | | | | |
| Neg_Feel_C | 6.49 | 0.354 | 4.214 | < 0.001 |
| Wish_C | 7.74 | 0.287 | 9.534 | < 0.001 |
| CI_Regret_C | 2.11 | 0.280 | -10.357 | < 0.001 |
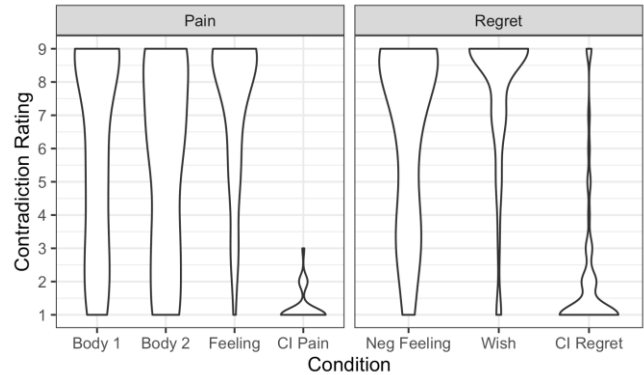


Figure 1: The violin plots show the distribution of the responses for all seven target contents tested in Study 2.

### 4.3. Discussion

In the pain condition, *Body1_C* and *Feeling_C* received ratings significantly above the midpoint, suggesting that both contents are semantically entailed by the claim 'I have a pain in my arm'. While we do not have a fully satisfactory explanation why the ratings for *Body2_C* were slightly reduced, it is possible that the more complex description had a negative effect on people's ratings. Finally, *CI_Pain_C* received low contradiction ratings, indicating that its content is only conversationally implicated.

## 5.  General Discussion

### 5.1. Summary of the Results

Our investigation aimed to provide a better understanding of the folk concept of pain using a new methodological approach, based on well-established linguistic tests. One of the central questions is what the semantic content of the folk concept of pain is. Three suggestions have been made in the literature: first, that the semantic content is mostly about a feeling, second, that it is about a bodily state, and third, that the semantic content includes both components. To experimentally address this question, we focused on first-person pain reports. This should allow us to decide between the Bodily View, Feeling View, and Pluralist View.

The results of Study 1 and Study 2 indicate that both bodily and feeling components met our criteria for semantic entailment, as outlined in Section 2 (see Table 5 for illustration). 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, are reliably inferred from Tom's statement 'I have a pain in my arm.' Second, these three implications do not project when embedded in an entailment-cancelling operator. Participants no longer infer a bodily or

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[9] We did not include the presupposed target contents and unrelated target content from Study 1, because their identity was already determined by the results of Study 1.

[10] All hypotheses, tests, and exclusion criteria were pre-registered: https://osf.io/kqnc8

[11] In order to not confuse the stimuli of Study 2 with the stimuli of Study 1, we labelled them with an extra 'C' for 'conversation'.

feeling component when Tom says 'I don't have a pain in my arm.' Third, the target statements cannot be denied when a first-person pain report is made without yielding a contradiction.

These results allow us to draw two conclusions about our research. We start with some methodological remarks, after which we put our research into a larger perspective.

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 | ☑ | ☒ | ☑ |

## 5.2. Methodological Remarks

Our investigations show that well-established linguistic tests, namely the Implication, Projection, and Deniability Tests, prove fruitful in their application to first-person pain reports. The regret condition that served as our control confirms that the experiments were well-designed. We consider this as an innovative shift in the methodological access of the current philosophical-experimental debate that can help us to identify aspects of the folk concept of pain that have so far gone unnoticed. Going beyond previous studies, by using first-person pain reports, we examined one of the most frequent uses of the concept of pain, which is also of particular relevance for the communication between patients and medical personnel. This allows us to avoid competence-performance effects and possible biases that may shift people's responses in vignette-based studies.

We would also like to point out three possible limitations of our experimental framework. First, first-person pain reports may also provoke certain biases. While the presentation of pain statements is relatively context-free in our studies, participants may already have a particular context in mind in which the corresponding statements typically occur. Our design is unable to speak to the context that participants imagined.

Second, we need to remain cautious about whether our three tests can jointly prove what is part of the semantic content of the folk concept of pain. One critical shortcoming of the design is that Deniability Tests cannot determine whether the statement is considered contradictory because of semantic contradiction or because the two features usually co-occur. Even if the data available so far are promising, it could turn out that especially the Deniability Test does not indicate contradictions and thus semantic contents, but only what people *typically* expect in a certain context.

Third, while our experimental design is most likely to be apt for prototypical cases, it might have problems with cases of referred pain in which the location of a disturbance and the felt location dissociate. Patients suffering from a heart attack or spinal disc herniation often report pain in, e.g. their arm, even though their arm is perfectly fine. Our two bodily conditions might be inadequately formulated to address pains of this sort. This issue might further explain the lower contradiction ratings and wider distribution of responses in the bodily conditions. In our opinion, this does not generally speak against our experimental framework but underlines once again the complexity of the folk concept of pain and the methodological ingenuity needed for its investigation.

## 5.3. Implications for the Folk Concept of Pain

The results of our studies might seem at first to provide positive news for the Bodily View and the Feeling View. Bodily and feeling components appear to be semantically entailed in first-person pain statements. However, both views seem to tell only half of the story while the Pluralist View provides the most plausible account to explain our data. Information regarding *both* a bodily disruption and an unpleasant feeling seem to be communicated as part of the semantic content of the folk concept of pain in *first-person pain reports*. As such, the results of our study do not contradict the results of previous vignette studies but primarily complement them. That said, we need further investigations into why the implications from third-person vignette studies (e.g., Sytsma & Reuter, 2017, Reuter & Sytsma, 2020) differ in important respects from the implications of our studies using first-person pain reports.

In our studies, *Body1* and *Feeling* turn out to be semantically entailed. Both target contents satisfied our pre-defined criteria for when an implication counts as semantically entailed. Ratings for *Body2* are above the midpoint but not significantly so. We recommend further investigation into why the means are not higher. Second, the statement about an unpleasant feeling is more strongly inferred and elicits higher contradiction ratings. This is evident in the mean response and response distribution of the Deniability Test (see Figure 1). It is yet unclear how to interpret this difference (but see our discussion on referred pain above). How the bodily and feeling component exactly relate to each other as part of the semantic content of the folk concept of pain, e.g., whether one is more central than the other, must be the subject of further investigation.

Finally, we would like to highlight that our studies motivate the Pluralist View, giving up on the idea of a univocal meaning of the folk concept of pain. Pluralistic accounts come in multiple different flavors (Borg et al., 2020; Coninx, 2020; Corns, 2020; Liu, 2021a, 2021b). Most likely, not all of them are compatible with the combined results of vignette-based and our linguistic studies. However, a pluralistic approach is certainly more promising in predicting that the bodily and the feeling component are both semantically entailed in paradigmatic first-person pain reports. This, of course, would suggest that the folk concept of pain is not paradoxical but *merely* complex.

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