The Intuitive Invalidity of the Pain-in-Mouth Argument

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1. Introduction

The pain-in-mouth argument, due to Block (1983), presents a puzzle about pain. Consider the following inference:

> There is a pain in my fingertip.
>
> The fingertip is in my mouth.
>
> Therefore, there is a pain in my mouth.

Intuitively, the argument is invalid, but philosophers disagree over what precisely explains the intuitive invalidity at issue, and furthermore, they often take their proposals to support different philosophical theories of pain.

Tye (1995, 2002, 2005) contends that the argument is invalid because 'pain' creates an intensional context. He takes his proposal to support representationalism about pain, according to which pain experiences represent tissue damage. Noordhof (2001, 2002, 2005), agreeing with Block (1983), thinks that the 'in' of 'pain in X' is non-spatial and the phrase should be understood as describing X as being in a particular state.

In a recent paper (2019), appealing to empirical results, Reuter, Sienhold and Sytsma (RSS henceforth) argue against these two existing proposals and put forward an *implicature account*. They contend that the conclusion in the argument carries the conversational implicature that *there is something wrong with the speaker's mouth*. But the premises don't carry this implicature. This explains why we have the intuition that the argument fails, though the argument, on this proposal, is strictly speaking valid. RRS (2019:

81) take their proposal to support the bodily view of pain, according to which pains are states of the body, not states of the mind (see Reuter & Sytsma 2018).

This paper argues against the implicature account. It offers two arguments – one theoretical and one empirical – against the proposal (section 2). Drawing on further empirical evidence, it shows that pain reports using locative locutions, e.g. 'there is a pain in my mouth', are intuitively understood by ordinary English speakers as *entailing* corresponding predicative locutions, e.g. 'my mouth hurts'. The paper thus vindicates a rather simple and unsurprising solution to the pain-in-mouth puzzle: the *entailment account*, according to which the argument seems invalid because the conclusion is understood as entailing something that cannot be inferred from the premises (section 3). The philosophical implications of this proposed solution are also drawn (section 4).

2. *Against the Implicature Account*

RSS (2019: 74) model the pain-in-mouth argument on the following kinds of arguments:

> There is tissue damage in my finger.
>
> The finger is in my mouth.
>
> Therefore, there is tissue damage in my mouth.
>
> There is an inflammation in my finger.
>
> The finger is in my mouth.
>
> Therefore, there is an inflammation in my mouth.

Like the pain-in-mouth argument, the above arguments also seem invalid. RSS's (ibid.) explanation for the intuitive invalidity of these arguments crucially lies with their claim

that the following utterances, 'in most conversational settings', carry the conversational implicature that *there is something wrong with the speaker's mouth*:

There is a pain in my mouth.

There is tissue damage in my mouth.

There is an inflammation in my mouth.

According to RSS (ibid.), we are inclined to judge that the above arguments fail because their conclusions all carry the *generalised conversational implicature* 'that something is wrong with the speaker's mouth, while the premises carry no such implicature'. However, RSS's proposal fails to provide a full explanation for the intuitive invalidity of these arguments.

A generalised conversational implicature is carried by an utterance of a proposition in most ordinary contexts of utterance (Blome-Tillman 2013: 178). Consider the following two well-known examples of generalised conversational implicatures from Grice (1975: 56):

(a) 'I went to a college yesterday.'

(b) 'I'm meeting a woman for dinner tonight.'

In most ordinary contexts, (a) carries the implicature that the college I went to is not mine; (b) carries the implicature that the woman is not my wife. Now consider the following arguments:

[A1]

I went somewhere yesterday.

This somewhere is a college.

I went to a college yesterday.

[A2]

Someone is meeting a woman for dinner tonight.

This someone is I.

I am meeting a woman for dinner tonight.

In both arguments, it seems that the conclusion carries a generalised conversational implicature which is not carried by the premises. Regarding [A1], we can easily imagine ordinary conversational contexts where a subject, say, upon being asked whether she was home yesterday, replies naturally with 'I went somewhere yesterday', which does not implicate that the place the speaker went to was not her college. Similarly, regarding [A2], there seem to be ordinary contexts where the utterance of 'Someone is meeting a woman for dinner tonight' does not carry the conversational implicature generally associated with the conclusion. Such a context could be one where the gender of the person (in this case, *woman*) or the purpose of the meeting (*for dinner*) or the time of the meeting (*tonight*) is contextually salient. Regarding the first option, for instance, upon seeing a lone woman sitting at a table for two in a restaurant typically full of men, one waiter says to another: 'It looks like someone is meeting a woman for dinner tonight', which does not implicate that the woman is not this someone's wife.

RSS explain the intuitive invalidity of the pain-in-mouth argument in terms of a generalised conversational implicature carried by the conclusion but not carried by the premises. [A1] and [A2] are like the pain-in-mouth argument in this respect. However, we do not judge them to be invalid nor do we find the conclusions misleading. More generally, just because the conclusion of an argument carries a certain generalised conversational implicature which is not carried by the premises, it does not follow that we find the argument intuitively invalid. So, RSS's account, as it stands, cannot adequately explain the intuitive invalidity of the pain-in-mouth argument.

Furthermore, RSS's claim that utterances such as 'there is a pain/tissue damage/an inflammation in my mouth' carry the conversational implicature that 'there is something wrong with my mouth' is questionable. Conversational implicatures are usually thought of as explicitly *cancellable* (Grice 1975: 44; Blome-Tillman 2008, 2013). If utterance 'P' merely conversationally implicates Q, then the utterance 'P, (but) not Q' is admissible or at least not outright contradictory. This is known as 'the cancellability test'. Consider the following example from Blome-Tillman (2013):

A: Are you going to the party tonight?

B: I don't like parties.

B's utterance carries the conversational implicature that *B won't go to the party tonight*. But this implicature is explicitly cancellable. B would not be contradicting herself if she uttered the following:

(1) I don't like parties, but I'll go to this one anyway.

Generalised conversational implicatures like 'I'm meeting a woman for dinner tonight' also pass the cancellability test. The following utterance is admissible:

(2) I'm meeting a woman for dinner tonight. It's my wife.

The cancellability test helps to distinguish conversational implicatures from semantic entailments. Semantic entailments fail to cancel (Blome-Tillman 2013: 172):

(3) #Elliot is a bachelor (i.e. a single man), but he is married.

(4) #The general killed himself, but he was not dead.

Given the standard cancellability test, and given RRS's implicature account, namely that utterances like 'there is a pain/tissue damage/an inflammation in my mouth' carry the

conversational implicature that 'there is something wrong with my mouth', the following sentences should be admissible:

(5) There is a pain in my mouth, but there is nothing wrong with my mouth.

(6) There is tissue damage in my mouth, but there is nothing wrong with my mouth.

(7) There is an inflammation in my mouth, but there is nothing wrong with my mouth.

Two observations are to be made here. First, (6) and (7) do not sound admissible at first pass, or at least do not sound as admissible as (1) and (2), which are cancellable conversational implicatures. Second, (5) may or may not sound inadmissible depending on whether one is aware of cases of referred pains, where pains are perceived in locations which are not the source of the painful stimuli.[1]

[1] According to RSS's study, participants showed an increase in approval of the conclusions of the pain-in-mouth argument, and corresponding arguments featuring 'tissue damage' and 'inflammation', upon being prompted to ignore the misleadingness of relevant conclusions and rate whether they 'technically speaking' follow from the premises. RSS take this to show that the relevant implicature is cancellable to some extent. However, the increase is small (see 2019: 80-1). For instance, the average rating for the acceptability of the conclusion in the pain-in-mouth argument after the prompt still falls short of the midpoint (increased from M=2.10 to M=3.79). (RSS used a seven-point Likert scale, where 1 is 'Strongly Disagree', 7 is 'Strongly Agree', and 4 is 'Neither Agree nor Disagree'.) One might wonder whether the increase is simply due to other factors, e.g. demand characteristics, rather than the cancellability of the implicature.

To test these two observations, experimental data were collected from 121 participants on Amazon Mechanical Turk. Participants were first given the following vignette:

> In this task, you will be asked to judge whether some sentences make sense or not. You are asked to pay attention to the content of the sentence, i.e. what the sentence says.
>
> In order to understand the task, please read the following example:
>
> Consider the sentence: 'The tabletop is rectangular, but it has three sides'.
>
> The sentence doesn't make sense at all. It expresses a contradiction, because something cannot be rectangular while having three sides at the same time.

Participants were then asked to rate whether sentences (1)-(7) make sense.[2] The sentences were randomly ordered. A 7-point Likert scale was used where '1' means 'The sentence makes perfect sense' and '7' means 'The sentence makes no sense at all'.

Results were compared across three groups: *cancellable conversational implicatures*, i.e. (1) and (2); *contradictions*, i.e. (3) and (4); and *bodily conditions*, i.e. (5)-(7). Most participants gave low ratings to (1) (M=1.76, SD=1.29) and (2) (M=1.43, SD=0.97). Most participants gave high ratings to the two instances of contradictions, i.e. (3) (M=6.75, SD=0.99) and (4) (M = 6.85, SD=0.72), as well as the three cases of bodily conditions, i.e. (5) (M=5.45, SD=1.85), (6) (M=6.19, SD=1.48), and (7) (M = 6.13, SD=1.45).

[2] Participants were 62.5% women and 100% native speakers of English with an average formal education of 15.6 years.

Results showed that participants did not treat the three sentences about bodily conditions like cancellable conversational implicatures.[3] The results are presented as Figure 1 below.

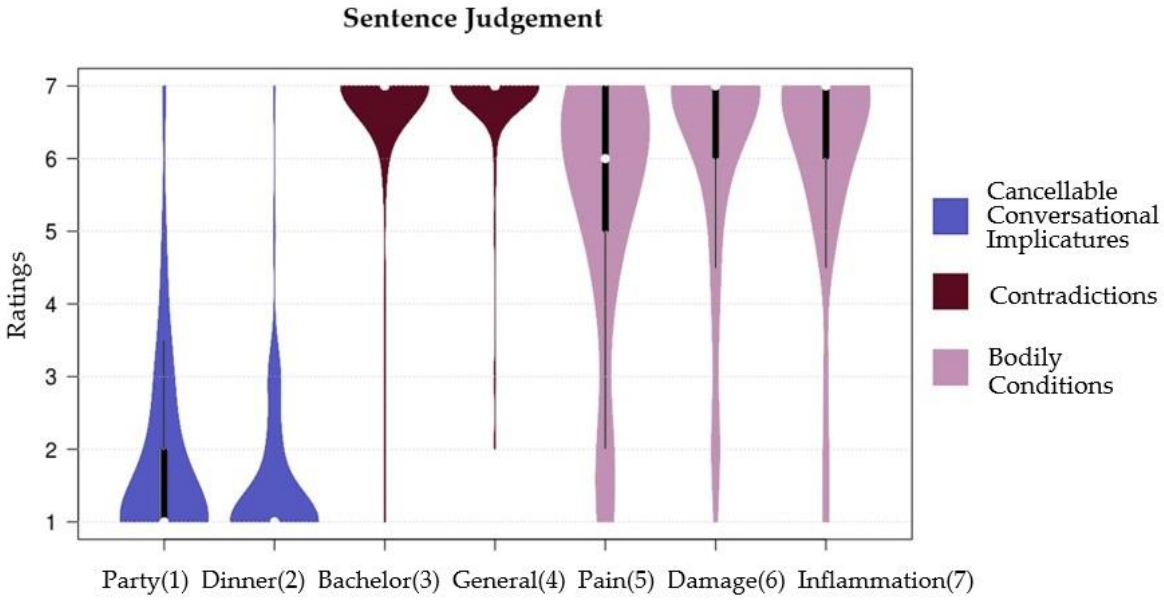

Figure 1: A violin plot displaying the distribution shapes of ratings of whether sentences (1)-(7) make sense. White dots indicate median values. Thick black bars represent interquartile ranges. Thin black lines extended from black bars represent the upper and lower adjacent values in the data, where the upper adjacent value is the largest observation that is less than or equal to the third quartile plus 1.5*the interquartile range, and the lower adjacent value is the smallest observation that is greater than or equal to the first quartile minus 1.5*the interquartile range.

[3] The ratings for each of the three groups were averaged first. A pairwise comparison showed significant differences between the average ratings of bodily conditions and cancellable conversational implicatures [$t(87)=25.28$, $p<0.001$]. The comparison between the average ratings for bodily conditions versus contradictions had a smaller effect size [Cohen's $d=0.86$], whereas the comparison between the average ratings for bodily conditions versus cancellable conversational implicatures had a larger effect size [Cohen's $d=3.87$].

To ensure statistical differences did not arise due to the different number of items in each category, results were also compared between the average ratings of the 2 sentences in the cancellable conversational implicatures category (1&2) and subsets of 2 sentences in the bodily conditions category. Three pairwise comparisons showed significant differences between the average ratings of cancellable conversational implicatures (1&2) and the average ratings of bodily conditions [5&6: $t(87)=23.23$, $p<0.001$; 5&7: $t(87)=22.20$, $p<0.001$; 6&7: $t(87)=28.03$, $p<0.001$].

Results also showed that the average rating of (5) was lower than those of (6) and (7) ((5): M=5.45, SD=1.85; (6): M=6.19, SD=1.48, and (7): M = 6.13, SD=1.45).[4] Participants were asked to specify their reasons for their ratings of (5), and were given three options: (a) '*I thought if someone has a pain in his/her mouth, then there must be something wrong with the person's mouth*'; (b) '*I am aware of cases of referred pains, where one can have a pain in one part of the body but there is nothing wrong with that body part*'; (c) *Other*. Further examination of the participants' ratings revealed that the lower average rating for (5) was driven by participants whose reasoning aligned with choice (b). Specifically, participants who chose (b) had an average rating of 3.94 (SD=1.91), whereas participants who chose (a) and (c) had average ratings of 6.39 (SD=1.00) and 6.67 (SD=0.58) respectively. The breakdown of the participants who chose (a), (b) and (c) was 58.0%, 38.6%% and 3.4% respectively.

It should be noted that although (6) and (7) received high average ratings, results did not show that participants treated them like semantic contradictions such as (3) and (4).[5] A plausible explanation, as noted in one participant's feedback, is that the utterance 'there is something wrong with my mouth' might indicate a level of severity. A subject can have a pain/an inflammation/tissue damage in the mouth, while insisting that there is nothing wrong with her mouth, meaning that there is nothing serious or nothing to worry

[4] A pairwise comparison showed significant differences between the ratings of (5) and (6) [$t(87)=3.73$, $p<0.001$], and between the ratings of (5) and (7) [$t(87)=4.26$, $p<0.001$]. A pairwise comparison showed no significant difference between the ratings of (6) and (7) [$t(87)=0.44$, $p=0.66$].

[5] A pairwise comparison did show significant differences between average ratings of (6) and (7) on the one hand and contradictions on the other [$t(87)=4.66$, $p<0.001$].

about regarding her mouth. It could also be that not everyone associates pains/tissue damage/inflammations with negative valence.

But that (5)-(7) were not treated like typical cases of semantic contradictions is not evidence that they involve conversational implicatures. On the contrary, the empirical data suggest the opposite. Given RSS's implicature account, one would naturally expect (5)-(7) to be judged as similar to (1) and (2), rather than (3) and (4). However, this was not the case. RSS might insist that conversational implicatures are cancellable to different extents and some are very hard to cancel. But this is not an adequate response. The burden is on RSS to explain why (5)-(7), supposing they involve conversational implicatures, are so hard to cancel. In other words, RSS must explain why they are special such that they were judged to be nothing like standard cases of cancellable conversational implicatures but more like contradictions.

3. The Entailment Account

What then explains the intuitive failure of the pain-in-mouth argument? In their recent paper, Liu and Klein (2019) draw attention to the distinction between two distinct kinds of pain reports in English: (i) the *locative locution*, e.g. 'there is a pain in my back', which at the level of surface grammar describes pains as things located in body parts;[6] and (ii) the *predicative locution*, e.g. 'my back hurts', whose surface grammar attributes a state to a body part. A number of philosophers have previously suggested that the two kinds of pain reports are closely related (Hyman 2003; Bain 2007). A plausible explanation for the pain-

[6] Liu and Klein note four features of the locative locution: 'pain' takes the *prepositional phrase* 'in NP'; is *countable*; permits an *existential construction* and also a *possessive construction*.

in-mouth puzzle is the following: in English, pain reports using locative locutions are intuitively understood as *entailing* corresponding predicative locutions – the conclusion of the pain-in-mouth argument, i.e. 'there is a pain in my mouth', entails that 'my mouth hurts'. This consequence should also be entailed by the premises. But it is not. So, the conclusion of the argument does not follow from the premises, and the pain-in-mouth argument is intuitively judged to be invalid. Call this 'the entailment account'.

To empirically test this hypothesis, the same participants were asked to rate, again on the scale of 1-7, whether the following two sentences make sense:

(8) There is a pain in my mouth, but my mouth doesn't hurt.

(9) My mouth hurts, but there is no pain in my mouth.

Participants were then explicitly asked whether the following two sentences mean the same thing:

(10) There is a pain in my mouth.

(11) My mouth hurts.

Results showed that the average ratings for (8) and (9) were 6.76 (SD=0.86) and 6.67 (SD=0.81) respectively, and that participants treated (8) and (9) just like the two cases of semantic contradictions, i.e. (3) and (4).[7] The results are summarised in Figure 2:

[7] ANOVA yielded no significant difference among (3), (4), (8) and (9) [$F(3, 348)=0.68$, $p=0.58$]. The two one-sided sample tests (TOST) procedure (Lakens 2017) showed statistical equivalence between the average ratings for contradictions and ratings for (8) [$\Delta_L=-0.20$, $\Delta_U=0.28$, $t(174)=-82.44$, $p<0.001$], as well as between the average ratings for contradictions and ratings for (9) [$\Delta_L=-0.10$, $\Delta_U=0.36$, $t(174)=-84.19$, $p<0.001$]. (For all equivalence tests conducted in this paper, the lower t-value, associated with the higher p-value, is reported).

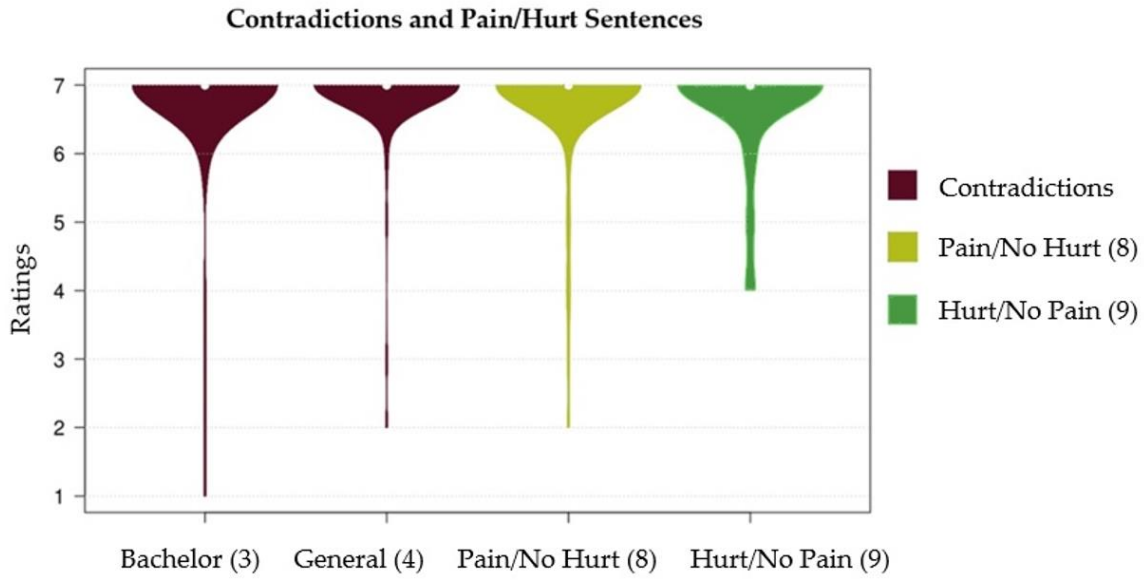

Figure 2: A violin plot displaying the distribution shapes of ratings of whether sentences (3), (4), (8) and (9) make sense. White dots indicate median values. For each category, the interquartile range, i.e. the distance between the upper and lower quartiles, is 0, and the upper and lower adjacent values are all at 7.

80.7% responded that (10) and (11) mean the same thing.[8] The results showed that while (10) and (11) are thought of as mutually entailing, they are not universally treated as having the same meaning.

A second experiment was also done with a new set of participants. Data were collected from 124 participants on Amazon Mechanical Turk. This time, participants were given six sentences: (3), (4), (8), (9) and two sentences which are clearly non-contradictory. The order of the sentences was randomised. Instead of being asked whether or not the sentences *make sense*, they were asked whether the sentences are *contradictions* on the scale of 1-7 where '1' means 'This sentence is definitely not a contradiction' and '7' means 'This sentence is definitely a contradiction'. Similar results were found: (3) (M=6.74, SD=1.10); (4)

[8] 11.4% thought they don't mean the same, of which 40% gave a rating of 7 to both (8) and (9). 5.7% were not sure; 2.3% gave their own responses.

(M=6.88, SD=0.59); (8) (M=6.80, SD=0.69); (9) (M=6.74, SD=0.74).[9] Again, participants treated (8) and (9) just like contradictions.[10]

If (8) is treated as a contradiction, i.e. (10) is thought of as entailing (11), then it's no surprise that the pain-in-mouth argument seems invalid. The underlying reasoning of our judgment regarding the intuitive invalidity of the argument may be spelt out in the following way: if the premises of the argument entail the conclusion, i.e. (10), and (10) entails (11), then the premises should also entail (11). But they don't, so the premises don't entail the conclusion and the argument is invalid.

The entailment account proposed here, although similar to some existing accounts in the literature, such as Noordhof's account and the 'paraphrase account' mentioned by Hyman (2003) and Bain (2007), needs to be distinguished from them. According to the latter two proposals, (10) ought to be understood as (11). For Noordhof (2001, 2002), this is so because the relevant 'in' is non-spatial but used in state-attributing sense. For Hyman (2003: 16-7) and Bain (2007: 182), it is because (10) can be paraphrased as (11) without any loss of meaning. The entailment account is less committal. It does not claim that the 'in' of

[9] The two non-contradictory sentences were: 'If today is Sunday, then yesterday was Saturday'; 'Tom's bookshelf is full of books'. The average ratings for these two sentences were 1.15 (SD=0.87) and 1.05 (SD=0.31) respectively.

[10] The two one-sided sample tests (TOST) procedure showed statistical equivalence between the average ratings for contradictions and ratings for (8) [Δ_L=-0.18, Δ_U= 0.20, t(218)=-102.87, p<0.001], as well as between the average ratings for contradictions and ratings for (9) [Δ_L=-0.13, Δ_U= 0.27, t(218)=-98.88, p<0.001]. Participants were also asked whether (10) and (11) mean the same thing. This time, 86.3% responded affirmatively.

'pain in X' is non-spatial.[11] Nor is it committed to the idea that (10) and (11) have the same meaning, however meaning is conceived. It only claims that ordinary English speakers treat (10) as entailing (11), which is supported by empirical data.

Philosophers have compared the pain-in-mouth argument with a number of other arguments which also seem invalid. Notably, Noordhof (2001) has compared it with 'the hole-in-box argument' – there is a hole in my shoe; the shoe is in the box; therefore, there is a hole in the box. Tye (1995) has compared it with invalid arguments involving propositional attitude verbs: Tom believes that he is in Vancouver; Vancouver is in Canada; therefore, Tom believes that he is in Canada. RSS have compared it, as we saw, with arguments involving tissue damage and inflammation. The entailment account provides an explanation as to why the pain-in-mouth argument seems intuitively invalid to us. An advocate of the account is not required to explain the intuitive failures of these other arguments. It could well be the case that different kinds of explanations should be given to account for the intuitive failures in these other arguments.[12]

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[11] The claim that the 'in' of 'pain in X' is non-spatial but state-attributing is problematic (see also Hyman 2003; Reuter et al. 2019). There are clear examples of state-attributing uses of 'in' in English: *in doubt*, *in love*, etc. In these cases, 'in' is followed by a noun phrase which indicates a state. In the case of 'in the fingertip/mouth', the relevant noun phrases do not indicate states – fingertips and mouths are not states.

[12] With some of these arguments, it may be conjectured that locutions such as 'there is an inflammation in my mouth', 'there is a hole in the box', etc. are also intuitively thought of as entailing propositions that can be expressed in some predicative form: 'my mouth is inflamed', 'my shoe is perforated', etc. which would explain why relevant arguments are also intuitively invalid. But this claim requires separate empirical testing.

4. *Conclusion*

As we saw in this paper, the implicature account fails to explain the intuitive failure of the pain-in-mouth argument. In contrast, the entailment account offers a plausible and empirically-backed explanation. The argument seems invalid because the conclusion is naturally taken to entail that the speaker's mouth hurts, which cannot be inferred from the premises. As it stands, this account makes no claims about where *pains* are located and is neutral between the mental and bodily conception of pain.

The entailment account is, however, in tension with the alleged possibility that one can have a pain in a body part without that body part *hurting*. In a number of places (e.g. Sytsma and Reuter 2017; Reuter and Sytsma 2018), Reuter and Sytsma have presented empirical evidence to show that ordinary English speakers are open to the possibility of unfelt pains or pains that don't hurt.[13] The evidence presented in this paper, in contrast, indicates that ordinary English speakers treat the utterance 'there is a pain in my mouth, but my mouth doesn't hurt' as a contradiction, which suggests that they take pains to necessarily hurt.

This tension between the two sets of evidence may plausibly reflect a tension in the (English) folk conception of pain. The overall situation seems to go some way in support of the recently proposed view of Borg et al. that the (English) folk conception of pain is *polyeidic*, that is, 'containing a number of different strands or elements', where 'in different contexts different elements of the concept could be activated, enhanced or supressed' (Borg et al. 2019). It may well be the case that what drives our intuitive judgement that the pain-

[13] See Borg et al. (2019) for a review of the relevant experimental literature.

in-mouth argument is invalid is the thought that *if there is a pain in X then X must hurt*. But such a conception of pain may be suppressed in some contexts. It is possible that when considering hypothetical scenarios concerning a particular imaginary subject (who is, e.g. distracted, on pain killers, etc.) and being explicitly asked in the locative forms whether *there is a pain* in the subject's body party or whether the subject *has a pain* (see Reuter and Sytsma 2018), participants might be triggered to focus on bodily damage and treat pains as concrete physical entities located in body parts, which in turn suppresses their conception of pains as necessarily hurt or felt. However, further study is required to understand the underlying factors that influence our judgements.[14]

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