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Valence first. An experimental investigation of the affective dimension of verb meaning.

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Abstract:	We present two experimental studies that suggest that affective meaning is cognitively prior to referential meaning. The first study shows that speakers are much faster in detecting the valence (positive or negative) of a given verb than its referential domain. The second study shows that speakers are generally much more sensitive to valence than to referential domain when asked to assess the semantic similarity of two verbs. The domain itself is only taken into account when the two lexical items already have the same valence. We take these results to be a motivation for acknowledging valence, and affective information more generally, as an important aspect of meaning.
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Title

Valence first. An experimental investigation of the affective dimension of verb meaning

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Valence first

An experimental investigation of the affective dimension of verb meaning

Abstract

We present two experimental studies that suggest that affective meaning is *cognitively prior* to referential meaning. The first study shows that speakers are much faster in detecting the valence (positive or negative) of a given verb than its referential domain. The second study shows that speakers are generally much more sensitive to valence than to referential domain when asked to assess the semantic similarity of two verbs. The domain itself is only taken into account when the two lexical items already have the same valence. We take these results to be a motivation for acknowledging valence, and affective information more generally, as an important aspect of meaning.

Keywords:

affective meaning, lexical meaning, valence, verb meaning, experimental linguistics

1. Introduction

Analytic philosophy of language has focused almost exclusively on referential, truth-conditional meaning; and so has formal semantics, which grew out of philosophy in the 1970s and became a self-standing discipline of linguistics. Neither discipline has taken the affective information carried by words, that is, the positive or negative attitudes and feelings that a word invokes, to be a suitable object of study. And while there has been a steady rise of interest, in the past fifteen to twenty years, in non-truth-conditional aspects of meaning – or what Potts (2007) calls "the *expressive* dimension" –, this interest has been limited to a relatively small subset of words, to wit, those for which the affective (especially negative) information is particularly striking, as in the case of slurring terms. Our long-term project aims to show that the importance of affective meaning is not limited to a privileged class of words, but rather, extends to words of all kinds, including those that have been central to the enterprise of truth-conditional semantics. In the present paper, we present two experimental studies that highlight the significance of affective information for the study of *verb* meaning. The first study shows that speakers are much faster in detecting the valence (positive or negative) of a given verb than its referential domain. The second study shows that speakers are more sensitive to valence than to referential domain when asked to assess how similar verb meanings are.

limited view of non TC meaning… grice, SA theory, presupposition (karttunen and peters), indexicality, de se….. kaplan « oops » « ouch »

The paper is structured as follows. Section 2 situates the present project within a broader theoretical landscape. More precisely, section 2.1. draws on some references to substantiate the claim that affective meaning has been widely dismissed in philosophy of language, and points to some recent attempts to integrate this kind of meaning into formal semantic frameworks (Potts 2005; Gutzmann 2015) but underscores certain limitations of these approaches. Section 2.2. then shows that there has been overall a similar lack of understanding of the significance of affect in psychology, but emphasizes some important references in the psychological literature which defended the view that affect is a channel of information distinct from and possibly prior to

cognition, and that affective processing may in some way or other influence cognitive processing. Section 3 is devoted to the experimental studies that we have conducted. In section 3.1., we present our first experiment, in which we asked participants to classify a selection of verbs across two criteria: first, according to their referential domain (physical vs. psychological), second, according to their valence (positive vs. negative). The results show that participants are faster in deciding the valence of a verb than its referential domain. In section 3.2., we present our second experiment, in which we asked participants to rate the similarity of the meanings of different verbs. While verbs with different domains but the same valence were judged to be semantically similar to a high degree, those with the same domain but different valence were not deemed semantically similar at all. However, among pairs of verbs of the same valence, those that also coincided in their domain (that is, are either both physical or both psychological) were judged to be more similar in meanings than those that do not. Section 4 discusses the implications of our studies for the study of word meaning.

2. Situating the project within a broader theoretical landscape

2.1. The dismissal of affective meaning in philosophy of language and semantics

It is widely agreed that Frege's *On Sense and Reference* set the foundations for contemporary philosophy of language, as well as formal semantics (even if the latter only developed from the seventies on, taking mainly inspiration from the work of Richard Montague). It should not come as a surprise, then, that affective meaning, which tracks speakers' subjective feelings and attitudes, has been almost completely dismissed, in both disciplines, as an unsuitable object of study. Indeed, Frege's misgivings about the relevance of psychological aspects is one of the hallmarks of his approach to logic and language. Here two relevant passages:

"The Reference and Sense of a sign is to be distinguished from the idea [Vorstellung] associated with it. If the Reference of a sign is an object that can be perceived by the senses, then my idea of it is an inner image brought about by memories of sense impressions that I have had, and of activities, internal as well as external, that I have carried out. This is often *soaked in feelings*; the clarity of its individual parts varies and vacillates." (Frege, 1892, p. 29, our italics).

"[B]ecause of the insecure connection of ideas with words, there may occur a difference for one person that another person cannot find. (...) The differences that are still possible here include the colourings and illuminations with which poetry and eloquence seek to endow Sense. These colourings and illuminations are not objective, but each listener or reader must create these for himself according to the hints of the poet or orator" (*ibid*, p. 31).

A way of rephrasing Frege's worries would be to say that the affective information associated with a word is necessarily subjective, and, as such, irrelevant to the study of meaning that aims at objectivity. While Frege's theory of sense and reference has received ample criticisms, his misgivings about affective meaning have remained largely unchallenged. The dismissal of the relevance of affective information sank even deeper down as the truth-conditional approach to meaning started consolidating itself as the mainstream approach. There is a famous dictum,

attributed to Davidson (1967) and widely endorsed ever since, that says that *to know the meaning of a sentence is to know its truth conditions*, and that even serves as the opening sentence of one of the most influential semantics textbooks, viz. Heim and Kratzer (1998). The dictum clearly suggests that the feelings invoked by a word, or a complex expression, have no role to play in the analysis of the word's or the expression's meaning *unless* they are truth-conditionally relevant. Consider the following minimal pair:

(1.a) Sophie's teacher encouraged her to continue in philosophy.
(1.b) Sophie's teacher discouraged her to continue in philosophy.

According to the truth conditional approach, the meaning of (1.a) is captured, roughly, by the assumption that (1.a) is true if Sophie's teacher did something that helped bring it about that she would continue in philosophy, and of (1.b), something that helped bring about the opposite. The positive feeling that a speaker would typically associate with (1.a) and, in general, with actions of encouragement, and similarly, the negative feeling typically associated with (1.b) and actions of *dis*couragement, seem altogether absent from the standard semantic analyses of sentences such as (1.a) and (1.b).

pietroski?

It should be said, in all fairness, that truth-conditional semantics has always had its critics, the alternative paradigm being *use*-conditional semantics. Analogously, referentialist semantics has been contrasted with *in*ferentialist semantics. However, the opposition between truth- and use-conditional approaches always rested on considerations that appear to be orthogonal to the issue of affective meaning. It is only in the last two decades that connections between use conditions and affective information have begun to see light. Kaplan's unpublished manuscript "The meaning of 'ouch' and 'oops': explorations in the theory of meaning as use" (1999) explores a way of integrating expressions that serve to convey one's feelings, rather than describe the world, into a formal semantic framework. Potts (2005) provides a multidimensional semantic framework that accounts for a class of terms known as "expressives"; that is, terms like 'bastard' and 'damn' whose function is, similarly, to convey the speaker's feelings and attitudes, rather than state anything. Gutzmann (2015) proposes a different multidimensional framework that attempts to account not only for the "pure" expressives, but also for the hybrid ones, which express feeling and attitudes and convey factual information all at once. Slurring terms, such as racial epithets, are a case at point. The interest in expressives and expressive meaning seems to be growing exponentially over the last few years; for overviews, see e.g. McCready (2020) on expressives, Cepollaro (2020) or Hess (2021) on slurs, and Jeshion (2021) for a taxonomy of pejorative meaning.

While it must be acknowledged that the 21st century philosophy of language and semantics - unlike those from the previous century - have been gradually making room for expressivity and thereby for phenomena that have to do with affective meaning, the received view still has it that such phenomena may concern only a small part of the lexicon but are generally irrelevant to the study of meaning of the vast majority of words, for which a truth-conditional, referentialist semantics is all that we need. In the present paper, we would like to push the relevance of affective meaning further than has been generally acknowledged. We think that whether a word conveys

positive or negative feelings is an important aspect of the meaning of many more words than those that are recognized as "expressives" (whether pure or hybrid). In other words, we take expressivity to be a broad and ubiquitous phenomenon, rather than a feature specific to only certain terms. This is why we have conducted our studies on verbs – and not any special ones (such as 'fuck', occasionally discussed in the literature on expressive meaning), but plain vanilla verbs, such as 'build' and 'tear', 'clean' and 'stain', 'reassure' and 'criticize'. We aim to show that valence – positive or negative – should be seen as a crucial element of the meaning of those verbs.

2.2. A snapshot at psychological literature

In psychology likewise the significance of affect was widely dismissed until the end of the 20th century. This was true in the behaviourist era, but also at the time of the so-called 'cognitive revolution', which assumed people to be first of all rational actors and took affect to be an epiphenomenon occurring after perception and in reaction to it, rather than a phenomenon central to perception and thought (Barrett and Bar 2009, p. 1328).

In the 1950s a movement composed from different research programs on perception proposed to shift the perspective on affect. Called the New Look, it defended the view that affective reaction to a stimulus can occur before conscious perception and can even contribute to shaping the actual content of the conscious percept. Different reasons can explain why the New Look did not have a significant impact on psychological theory at that time (Niedenthal and Kitayama 1994, p. 2). Indeed, work carried out by proponents of this view appeared extremely controversial and even now continues to be highly criticized (Firestone and Scholl 2016; Hafri and Firestone 2021). Despite their many flaws, in the following decades, these views on affect gradually became more prevalent and gave rise to important work focusing on the relationship between affective responses and cognitive processes that are not specifically located in perception.

Zajonc (1980, 2000) in particular defended the "affective primacy hypothesis". In his view, affect and cognition are two separate systems corresponding to two distinct channels of information. According to this view, it is wrong to assume that affect is necessarily "postcognitive". Instead affective reactions can happen in the absence of extensive cognitive processing. Zajonc argued that affective judgments are often made quicker and with greater confidence than cognitive judgments. According to him, one major piece of evidence for this view could be found in the "mere exposure effect", that is, in a series of experiments showing that subjects tend to rate more positively stimuli (e.g. non-words) to which they have been previously exposed, even when they are unable to recognize explicitly that they had actually been exposed to these. Although Zajonc's conclusions about affective primacy have been greatly discussed (see for example Storbeck and Clore 2007), his work crucially highlighted the fact that the retrieval of evaluative information may occur at a different stage, and possibly earlier, than the retrieval of conceptual, descriptive information in stimulus processing.

But if this is true for unfamiliar items such as non-words, does affect also matter for the processing of known lexical items? Several experiments suggest that it does. Nygaard and Queen (2008)

showed that affective tone can facilitate or on the contrary hinder word recognition. Storbeck & Clore (2008) provided evidence for the fact that in studies of semantic priming, people in a sad mood tend to be less sensitive to contextual stimuli and thus to be no faster in recognizing words after a brief exposure to a word similar in meaning, unlike what usually happens. But what about affective reactions elicited by words themselves, by their very meaning? Bargh et *al*. (1989) showed that when presented with trait adjectives at certain speeds, subjects were unable to recognize whether a stimulus word or a blank card had been shown and could not perform correct synonymy judgments, but they were able to make correct evaluative judgments about the adjectives. Such findings suggest that affective information in lexical meaning is taken into account at the earlier stage in word comprehension and arguably before referential information itself is processed.

More recent work looking at the spread of misinformation has highlighted the extent to which words' affective or emotional content plays a role in our propensity to share and accept information, thus illustrating important and non-obvious impacts of affective content on downstream processing, including but not limited to judgments about truth. We know that headlines for news articles (of the type that are shared on social media) are often worded in a way that will elicit an emotional reaction in readers (Aslam et al. 2020). Moreover, such strong affective responses have been shown to induce readers to be more likely to click on links to content (Reis et al. 2015), share true and fake news (Rosenzweig et al. 2021), and arrive at the conclusion that a piece of fake news is true (Martel et al. 2020).

Given this background work suggesting that affective processing may operate independently of cognitive processing and actually influence it, we ask here if in at least some circumstances affective information may indeed be "prior" to referential information. In Experiment 1 we examine this issue by assessing whether affective judgments about individual lexical items happen *faster* than judgments about the referential domain of the same words. In Experiment 2 we ask whether affective information may influence judgments about meaning similarity between two words to a greater degree than referential information. To foreshadow our results, we indeed find positive evidence in favor of a priority for affective processing in both experiments. We do not make a sweeping claim that affective information is necessarily prioritized over referential information in *all* cases, but we do see this as some evidence that such prioritization *can* happen for some types of stimuli to a surprising degree.

3. Experimental studies on the significance of affective meaning compared to referential meaning in lexical processing

Experiment 1

Introduction

In this experiment we were primarily interested in investigating whether one has quicker access to referential meaning or to affective meaning. In order to do this, through a careful norming study we created (in a 2x2 design) stimuli that carried either a positive or a negative affective content

and that referred either to physical or to psychological activities. We chose to focus on the contrast between the physical and psychological (as a comparison to valence) because a large body of research has shown that the distinction between these referential domains is salient throughout the lifespan. Infants form systematically differing expectations about the behavior of physical objects and that of social agents possessing psychological states. Thus while they do not expect inanimate physical objects to be able to intentionally create order, they know that social agents can do so (Newman et al. 2010). They understand that for an object to cause another physical object to move, it must come into direct contact with the object (Leslie and Keeble 1987), but they do not form similar expectations regarding social agents (i.e. they allow for distal causes of actions for social actors; Spelke et al. 1995). And they understand that objects are not capable of goal driven self-propelled motion, while they understand that social agents are capable of this (Saxe et al. 2005).

The salience of these referential domains does not just disappear when we grow up but instead constrains higher level reasoning and language processing into adulthood. Strickland et al.l (2017) showed that there is a robust tendency to ascribe a fewer number of causes (but not effects) to physical events (e.g. “A wave crashes”) than to psychological events (e.g. “A teacher becomes depressed”). This occurs even when the same event is just framed in psychological vs. physical/neurological terms. Kuhn et al. (2021) showed that adults formed systematically different judgments for words which referred to physical compared to psychological entities. Particularly for count nouns, participants judged those with physical referents (e.g. “coin”) as having clear and coherent boundaries while they did not judge those with psychological referents (e.g. “notion”) as having clear boundaries. This work furthermore illustrated that the way in which physical vs. psychological objects of reference are conceptualized influence participants’ sense of iconicity as measured by natural associations between sign and word meanings. So while participants were more likely to associate an unfamiliar sign containing a salient “gestural boundary” with count nouns than with mass nouns for words with physical referents (because these are conceptualized as having spatial boundaries onto which a gestural boundary can be iconically mapped), they did not do so for nouns with psychological referents, due to the absence of an available iconic mapping strategy.

This sort of background evidence makes comparisons between processing of affective (positive vs. negative) information and the processing of physical vs. psychological referential domains particularly interesting. There is every reason to suspect that the physical/psychological distinction would be highly salient in structuring how people process word meaning, and thus it is not obvious in advance that affective information should take a higher priority. Secondly, the physical vs. psychological distinction is at a level of abstraction that is roughly matched to the level of abstraction associated with positive vs. negative judgments. In both cases, the referents of many “basic level” words (Rosch et al. 1976) fall into these broad categories (i.e. being associated with one of the two valences or one of the two referential domains). Equating level of abstraction in this way helps control for other sorts of processing differences that might otherwise make comparison between valence and referential domain difficult.

for example? what are the expected processing confounds?

Participants were presented with the verbs of the four lists established in the pretest and should indicate as quickly as possible either whether the meaning of the verb was positive or negative or whether its meaning was physical or psychological. We asked whether despite the salience and obvious importance of the conceptual divide between the physical and psychological referential domains, people would nevertheless access affective information more quickly.

Methods

Pretest and stimulus creation

First we conducted a pretest experiment to establish four lists of verbs, namely 10 positive and psychological verbs, 10 positive and physical verbs, 10 negative and psychological verbs and 10 negative and physical verbs.

Participants
96 participants completed a paid online study through Amazon's Mechanical Turk.

Materials and Procedure
We used the lists of verbs established in the book *English verb classes and alternations* (Levin, 1993) and selected from them 168 verbs that were likely to match one of the four categories. The complete list is given in the Appendix.
We used a within-subject design. Participants were presented with 20 verbs randomly picked out from the list. For each verb, they were successively asked to evaluate its domain (physical *vs.* psychological) and its valence (positive *vs.* negative). So first, they were asked to indicate whether the meaning of the verb was more physical or more psychological by moving a slider on a scale: they were instructed that the more they thought the meaning of the verb was physical, the more they should put the slider on the left, and conversely, the more they thought the meaning was psychological, the more they should put it on the right. Second, they were asked to indicate whether the meaning of the verb was more positive or negative by moving a slider on a new scale: this time, they were instructed that the more they thought the meaning of the verb was negative, the more they should put the slider on the left, and conversely, the more they thought the meaning was positive, the more they should put it on the right. In both cases, participants were made aware that they were allowed to leave the slider in the center of the bar if they thought the meaning of the verb was neutral with respect to one or the other parameter (valence or domain). Each bar was numbered from 1 to 7, so participants' answers were recorded in terms of a number from 1 to 7 with possibly one decimal; yet the numeration did not explicitly appear on the screen so participants were unaware of it.

Results
The average rating for each verb is given in the Appendix.
We established the four following lists of verbs:

- *cuddle*, *build*, *repair*, *caress*, *hug*, *produce*, *sculpt*, *twinkle*, *decorate* and *clean* [positive and physical verbs]

- *content*, *encourage*, *appreciate*, *impress*, *like*, *reassure*, *respect*, *admire*, *adore* and *cherish* [positive and psychological verbs]
- *rust*, *slaughter*, *slash*, *crash*, *tear*, *burn*, *hit*, *stain*, *delete* and *corrode* [negative and physical verbs]
- *offend*, *despair*, *irritate*, *displease*, *dishonor*, *embarrass*, *discourage*, *dismay*, *criticize* and *dread* [negative and psychological verbs]

In each list, verbs were selected for a specific domain (physical or psychological) and a specific valence (positive or negative). To ensure that each verb exhibited the two properties both to a *high* degree and to a *similar* degree, we calculated for each verb the distance of its domain value and of its valence value to the extremity of the scale, namely 1 for physicality and negativity and 7 for 'psychologicality' and positivity, and we selected verbs whose distance to extremity for both domain and valence was between 0.2 and 1.35. Also, for each of the four lists, and for both domain and valence, we calculated the mean and standard deviation of the figures expressing distance to the extremity. The results were the following (reporting mean "distance to extremity"):

Positive Physical Verbs:
Domain: M=.83, SD=.40
Valence: M = .78, SD = .31

Positive Psychological Verbs:
Domain: M=.70, SD=.12
Valence: M = .61, SD = .18

Negative Physical Verbs:
Domain: M=.76, SD=.30
Valence: M = .82, SD = .27

Negative Psychological Verbs:
Domain: M=.73, SD=.17
Valence: M = .62, SD = .21

We ran a 2-way ANOVA comparing the mean distance from the extreme for domain judgments across the physical/psychological and positive/negative categories (in a by item analysis). There was no significant interaction between verb domain and valence $F(1,36)=.41$, $p=.53$. There was no significant difference between physical and psychological verbs, $F(1,36)=.83$, $p=.37$.

We also ran a 2-way ANOVA comparing the mean distance from the extreme for valence judgments. There was again no significant interaction between verb domain and valence $F(1,36)=.06$, $p=.81$. There was also no significant difference between negative and positive verbs, $F(1,36)=.08$, $p=.78$.

Main experiment

Participants
16 participants completed a paid online study through Amazon's Mechanical Turk.

Materials and Procedure
In one block of the experiment, participants were presented successively with each verb from the four lists (presented in a random order) and were asked to indicate as quickly as possible whether the meaning of the verb was positive or negative. They were instructed to press the 'B' key on their keyboard if they thought the meaning of the verb was positive, and 'N' if they thought the meaning of the verb was negative.

In another block, they were also presented with each verb of the lists (again in random order) and were asked to indicate as quickly as possible whether the meaning of the verb was physical or psychological. They were instructed to press the 'B' key on their keyboard if they thought the meaning of the verb was physical, and 'N' if they thought the meaning of the verb was psychological.

In both cases, participants were informed that they were under time pressure and had 2 seconds to answer but were asked to nonetheless maintain a high degree of accuracy. The order of the presentation of the blocks (i.e. valence judgment or domain judgment) was randomized across participants. Before starting both blocks with the actual items, participants were able to practice with three verbs for which there was no time pressure so that they could get a better feel for how the task would be once they would only have a limited amount of time to respond.

Results

All data analyses reported in this article were conducted in R (R Core Team, 2020) using RStudio (RStudio Team, 2020).

Fig. 1

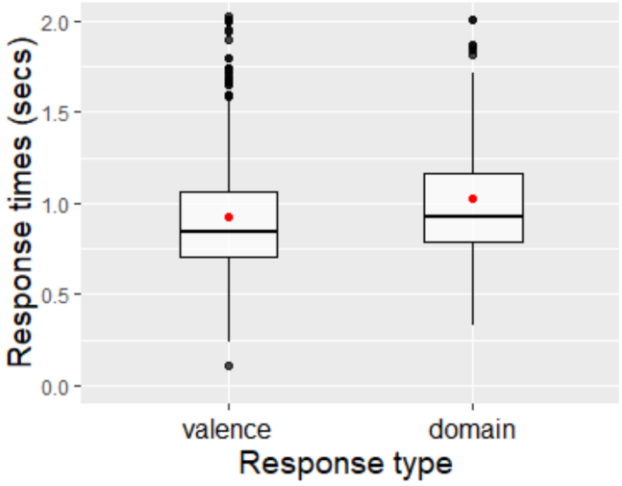

***Figure 1**. Participants' response times (in seconds) as a function of response type; Means are indicated by red dots.*

Data were fitted with a linear-mixed effect model, with Domain (physical vs. psychological), Valence (positive vs. negative) and Response type (valence vs. domain judgment) as fixed effects. A random intercept was added for Participant and Verb. Results showed that participants were overall significantly faster at responding to the valence question (M = .93, SD = .33) than to the domain question (M = 1.03, SD = .33), t = 3.02, p < .003. No effect of valence or domain was found (both p >.5).

Results of participants' response times (in seconds) as a function of response type are shown in Figure 1. We considered only the correct answers. The results were stable across participants: only one identified domain faster than valence, whereas all other participants detected valence faster. Note that the participant who was faster to detect domain overall showed the lower rate of correct answers (88% correct answers for valence and 53% correct answers for domain). The results were also stable across lexical items: for only 5 verbs over our 40 verbs was domain identified faster than valence.

Experiment 2

Introduction

here's really where i'd say it depends on the task demands in the moment…for what ourpose are we making the evaluation? the answer to this would determine the salience of domain or valence information….

In this experiment we asked whether one gives more weight to domain or to valence when comparing lexical meanings. Indeed, similarity judgements have been taken to adequately capture people's mental representations of word meaning (De Deyne, Perfors and Navarro 2016). Here, we used this methodology to investigate whether referential meaning indeed prevails or whether affective meaning may in fact have a similar or even a greater significance in our representation of lexical meaning. Participants were presented with pairs of verbs with the same referential domain and a different valence, pairs of verbs with the same valence but a different domain, pairs of verbs with similar domain and valence and pairs of verbs with different domain and valence. For each pair, they were asked to evaluate how much the meaning of the two verbs were similar. We were interested in knowing whether participants would give more weight to valence or to domain to assess the similarity of verbs, that is, whether they would judge more similar pairs with the same valence or pairs with the same domain.

Methods

Participants

62 participants completed a paid online study through Amazon's Mechanical Turk.

Materials and Procedure

We created 4 lists of 20 pairs of verbs out of the 40 verbs that we selected in the norming study and used in the first experiment.

Each list contained: 6 test pairs where the two verbs had the same domain and a different valence (for example, *to produce - to burn*), 6 test pairs where the two verbs had the same valence and a different domain (for example, *to hug - to like*), 4 control pairs where the two verbs had the same valence and domain (for example, *to caress - to build*), 4 control pairs where the two verbs had different valence and domain (for example, *to repair - to irritate*). In each list, the 6 test pairs displaying verbs with the same domain and a different valence included 3 pairs with physical verbs (for example, *to rust - to cuddle*) and 3 pairs with psychological verbs (for example, *to reassure - to embarrass*); the 6 test pairs displaying verbs with the same valence and a different domain included 3 pairs with positive verbs (for example, *to respect - to sculpt*) and 3 pairs with negative verbs (for example, *to tear - to offend*); the 4 control pairs displaying similar domain and valence included one pair of physical positive verbs (for example, *to caress - to build*), one pair of psychological positive verbs (for example, *to impress - to encourage*), one pair of physical negative verbs (for example, *to crash - to slaughter*) and one pair of psychological negative verbs (for example, *to displease - to despair*); and finally, the 4 control pairs with different domain and valence included 2 pairs with a positive psychological verb and a negative physical verb (for example, *to adore - to delete*) and 2 pairs with a positive physical verb and a negative psychological verb (for example, *to irritate - to repair*). To generate random lists, we associated each verb with a number and used the program 'random number generator'.

Each participant was randomly presented with one of the 4 lists. Each list was shown the same number of times. Within each list, pairs of verbs were presented in random order.
For each pair of verbs, participants were asked to indicate to which degree the two meanings were similar to each other by moving a slider on a scale from 0 to 6. They were instructed that the more they thought the meanings of the two verbs were dissimilar, the more they should put the slider on the left, and conversely, the more they thought the meanings of the verbs were similar, the more they should put it on the right. The numeration of the bar explicitly appeared on the screen. Participants' answers could only be given in integers.

Results

We performed a linear mixed-effects analysis with Condition (same domain same valence vs. same domain different valence vs. different domain same valence vs. different domain different valence) as fixed effects. A random intercept was added for each participant and test pair respectively.

As expected, results of the mixed-effects model showed that control pairs with different domain and valence (M = .42, SD = .94) received significantly lower similarity rating than pairs with similar domain and valence (M = 2.26, SD = 1.94), $t = -6.40$, $p<.0001$.

Pairs with the same valence but a different domain (M = 1.97, SD = 1.73) were rated as more similar than control pairs differing in both domain and valence, $t = 5.90$, $p < .0001$; furthermore, they were judged significantly more similar than test pairs with the same domain and a different

valence (M = .47, SD = .88), t = 6.41, p < .0001. Together, these results suggested that valence mattered, and that it was given more weight than domain in participants' similarity judgments.

Also, results showed another interesting phenomenon: test pairs with a different valence but the same domain were not judged significantly more similar than control pairs with different domain and valence, t = .17, p >.8. This suggests that participants took domain into consideration only if the two verbs had the same valence; as long as the two verbs had different valence, whether they had the same domain or not made no significant difference in similarity judgements, but once the two verbs had the same valence, they were judged significantly more similar if they also had the same domain.
Results of participants' similarity judgment as a function of word pair condition are shown in Figure 2.

Fig. 2

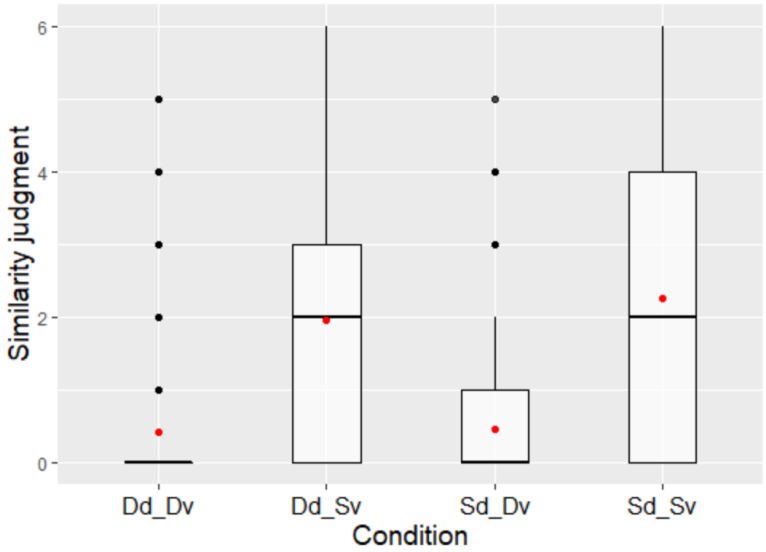

Figure 2. *Participants' similarity judgment as a function of word pair condition; Means are indicated by red dots. D = different; S = Same; d = domain; v = valence.*

4. Discussion

Let us take stock of our main findings. Our pretest study showed that there is a fairly robust convergence on the valence that speakers associate with verbs, and it allowed us to select fourty verbs that were systematically and reliably associated with the corresponding valence. In Experiment 1, we observed that speakers are much faster in deciding on the valence of verbs than on their referential domain (that is to say, in classifying the verb as physical or psychological). In Experiment 2, we observed that when asked to rate the semantic similarity between verbs, speakers were more sensitive to their valence than to their domain. The domain only seems to matter when the two verbs already had the same valence. Together, these findings support two theses (or so we argue): (i) affective information (and, more precisely, positive or negative valence) is an important aspect of the meaning of the verbs under considerations, and (ii) affective meaning

is - at least in some circumstances - cognitively prior to referential meaning for these verbs. Let us elaborate on both theses.

4.1. Valence as an aspect of lexical meaning

Even if it may be true that the affective information associated with words is often deeply subjective, it is noteworthy that many words elicit the same kind of affective response in a majority of speakers, and do so systematically. The existence of large sets of data concerning participants' affective response to words, such as Warriner et al. (2013) or Mohammad (2018), provide ample evidence to the effect that there are stable and systematic effects of association of affective information with words. Our pretest study similarly supports the idea that, for the words that we consider, there are systematic and reliable associations of valence. We believe that a view that takes valence to be an aspect of word meaning can offer a good explanation of our findings.

association |/= meaning

In our first experiment, we established that participants are overall faster in detecting a word's valence than its domain. Of course, this finding alone does not show that valence is part of meaning. For all we know, it could turn out that speakers are faster in detecting, for instance, certain syntactic features of a verb (e.g. whether it is transitive or intransitive) than its domain, or in deciding whether a word belongs to a specific register (e.g. whether it is colloquial or formal). Nevertheless, we maintain that Experiment 1 still provides compelling evidence for the hypothesis that valence is lexically encoded – and, to that extent, that it should be seen as an aspect of the verb's meaning. We reason by inference to the best explanation: among the possible linguistic levels at which valence *could* be located – syntactic, semantic or pragmatic –, the semantic level is the most plausible candidate. This being said, we do not dispute that some valence effects could be taking place at the level of syntax (see e.g. Israel 2004). Nor do we claim that pragmatics is not concerned with valence. Quite to the contrary, many examples of conversational implicatures are concerned with figuring out whether the speaker conveys something positive or negative with their utterance. But, at least on a standard approach to the relationship between semantics and pragmatics, if valence had been a merely pragmatic feature, one would not expect it to be detected faster than semantic features. In general, pragmatic processes are costly and take time. The robust, systematic and reliable way in which participants converge in detecting the valence of a verb gives every reason to think that their lexical knowledge of the verb's meaning provides them with information regarding the verb's valence. In sum, then, although the findings of Experiment 1 may not firmly establish that valence is an aspect of lexical meaning, they provide solid evidence to that effect.

Experiment 2 bears more directly on the hypothesis that valence is an aspect of meaning. Recall that participants were instructed to evaluate how similar the *meanings* of the different verbs are. The fact that verbs with different domains but the same valence are still judged to be similar in meaning to a significant degree shows that they take valence to be a relevant criterion of similarity between meanings. To be sure, one could try to argue that participants are mistaken in their judgment; but in the absence of any independent evidence that might support such a claim, it is most plausible to conclude that since ordinary speakers take valence to be an aspect of meaning, the theory of meaning should do so, too.

4.2. The cognitive priority of affective meaning over referential meaning

Our two experiments suggest that not only does affective information matter in the way one processes word meaning, but affective information may even matter *more* than referential information in one's representation of word meaning.

Our first experiment shows that valence is accessed more rapidly than domain for the verbs under examination. Whether this applies to all aspects of affective meaning and descriptive meaning respectively and to all kinds of lexical items remains to be established. But these findings appear in line with Zajonc's claim that affective judgments are generally made quicker than cognitive judgments. Furthermore, speakers appear to also consider valence as more significant than domain in word meaning, as shown by our second experiment for the words that we studied. Again, whether this is so for all kinds of affective information in word meaning and for every lexical item should be investigated further. But this seems to confirm another observation from Zajonc, namely that affective judgments are made with greater confidence than referential judgments. The fact that domain is taken into account by participants only when the two items have the same valence can be interpreted in a similar way: speakers first and foremost rely on affective information to grasp the meaning of a word, and referential information is a significant but still secondary aspect of lexical meaning in speakers' minds.

Overall, our results suggest that valence processing is temporally and conceptually prior to domain processing, and confirm that Zajonc's "affective primacy hypothesis" may well hold for word processing, or at least for some aspects of it, thus calling for a complete reexamination of how lexical meaning is addressed in traditional semantics.

4.3. Conclusion

Philosophy of language in the analytic tradition has traditionally focused almost exclusively on referential meaning. Affective meaning, which concerns the feelings and emotions associated with the use of language, has been kept at bay by theorists working in the tradition of truth-conditional semantics. Despite a growing interest in linguistic phenomena that pose a challenge to truth-conditional treatments, especially use-conditional and expressive meaning, recognition of the relevance of affective information has been fairly limited to this day. Our research constitutes an attempt at broadening the interest in affective meaning to a much larger portion of the lexicon. The two experimental studies that we report in this paper take verbs as their object of study. We have shown, first, that the valence of the verbs under consideration is detected much faster than their referential domain and, second, that valence plays a more important role than domain in shaping speakers' judgments regarding the similarity of verb meaning. Our findings provide compelling evidence for the hypothesis that valence is an aspect of word meaning, and that such affective aspects of word meaning are cognitively prior to the referential ones.

Declarations

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Appendix

List of verbs and corresponding ratings in our norming study

Verb	Domain rating	Valence rating
murder	1,14	1
disdain	6,78	1,1
stab	1,07	1,12
anger	5,71	1,12
anguish	5,92	1,14
rot	1,54	1,15
kill	1,65	1,15
demoralize	5,74	1,15
disgrace	6,15	1,15
degrade	5,35	1,18
distress	5,89	1,2
damage	2,89	1,21
regret	6,49	1,22
horrify	6,25	1,25

disappoint	5,87	1,27
loathe	6,56	1,27
destroy	2,37	1,28
despise	6,38	1,28
pollute	2,08	1,29
slaughter	1,5	1,3
degrade	4,17	1,3
mourn	6,51	1,34
upset	6,05	1,35
distrust	6,35	1,35
frustrate	6,47	1,36
despair	6,05	1,37
distrust	6,44	1,37
slap	1,18	1,38
stink	3,03	1,39
embarrass	6,36	1,41
resent	6,72	1,43
offend	6,04	1,47
dishonor	6,31	1,48
worry	6,66	1,5
frighten	5,64	1,52
distress	5,38	1,53
empty	3,48	1,54
rust	1,39	1,55
weaken	3,25	1,56
wither	2,7	1,57
discourage	6,36	1,57
displease	6,17	1,62

irritate	6,05	1,63
slash	1,52	1,65
deplore	5,28	1,65
dread	6,49	1,65
pulverize	1,28	1,66
stain	1,95	1,69
dissatisfy	5,66	1,69
disturb	4,55	1,7
shatter	2,66	1,73
annoy	5,25	1,75
burn	1,76	1,87
hit	1,8	1,9
shock	5,2	1,93
criticize	6,48	1,95
corrode	2,3	1,97
smash	1,29	1,99
tear	1,64	2,02
crack	2,4	2,02
dismay	6,37	2,02
crash	1,52	2,14
delete	2,18	2,15
exasperate	5,1	2,16
execrate	4,91	2,24
break	2,07	2,27
dirty	2,63	2,29
pinch	1,58	2,34
knife	1,41	2,37
bore	5,13	2,38

lament	5,23	2,38
depress	4,84	2,41
punch	1,56	2,44
pierce	1,97	2,56
disquiet	5	2,57
cut	1,23	2,67
rip	1,75	2,68
collapse	2,28	2,83
disassemble	1,64	2,9
freeze	1,84	2,91
scrape	1,68	3,03
bite	1,39	3,21
stroke	1,76	3,26
miss	5,53	3,31
scratch	1,98	3,32
soar	1,45	3,38
harden	3,05	3,48
fabricate	3,95	4,01
thaw	1,96	4,02
surge	2,59	4,38
embellish	5,05	4,55
enlarge	1,72	4,6
fill	2,58	4,76
loosen	2,44	4,91
evolve	3,64	4,93
quiet	3,89	4,93
appease	5,64	5,09
solace	5,82	5,09

arrange	2,64	5,1
forge	3,1	5,1
merge	2,1	5,16
scintillate	4,82	5,24
revere	5,61	5,24
clear	4,14	5,27
value	5,28	5,38
assemble	1,43	5,43
ornament	2,27	5,54
thrill	5,95	5,57
increase	3,76	5,58
pet	1,65	5,62
construct	1,72	5,66
console	5,34	5,66
rise	3,22	5,68
sparkle	3,44	5,68
develop	3,92	5,68
sculpt	2,17	5,71
shimmer	2,76	5,73
soften	3,85	5,74
esteem	6,8	5,79
balance	3,22	5,82
repair	1,53	5,91
enthrall	6,35	5,91
shine	2,93	5,94
decorate	2,31	5,95
adorn	2,84	5,98
generate	2,78	6

advance	3,28	6,03
impress	6,25	6,06
produce	1,83	6,1
content	6,15	6,1
create	2,54	6,17
lighten	2,56	6,17
grow	3,33	6,17
enchant	5,36	6,19
caress	1,61	6,21
please	5,47	6,25
twinkle	2,18	6,26
clean	2,35	6,29
appreciate	6,16	6,3
glorify	6,7	6,3
like	6,29	6,32
support	4,92	6,34
strengthen	2,94	6,36
please	6,38	6,36
relax	3,44	6,41
build	1,32	6,43
admire	6,4	6,45
cherish	6,46	6,46
satisfy	5,7	6,48
adore	6,45	6,48
bloom	2,73	6,53
encourage	6,15	6,53
inspire	6,53	6,55
compliment	5,19	6,57

reassure	6,35	6,57
improve	5,16	6,58
congratulate	4,65	6,59
respect	6,38	6,6
delight	6,6	6,6
cuddle	1,21	6,62
praise	5,9	6,63
enjoy	6,51	6,66
hug	1,81	6,7
heal	3,36	6,71
trust	6,84	6,75
honor	6,33	6,8
kiss	2,1	6,84
love	6,69	6,86