To appear in the Proceedings of the 2018 Berkeley Linguistic Society Meeting

# Effects of sensory modality on the interpretation of subjective adjectives: Comparing sight, smell and taste

ELSI KAISER
*University of Southern California*[*]

## 1 Introduction

The notion of evaluation is fundamental to our cognition and perception (e.g. Markus & Zajonc 1985), and there exists a range of subjective linguistic expressions, including a class of adjectives known as PREDICATES OF PERSONAL TASTE, such as *fun, tasty, disgusting, amazing*, that reflect evaluative attitudes. To understand these subjective adjectives, one needs to know whose opinion/attitude is being conveyed. Predicates of personal taste are often analyzed as making reference to a judge, attitude holder or evaluator (e.g. Lasersohn 2005, Potts 2007, Stephenson 2007, Patel-Grosz 2012, but see also Pearson 2013). In this paper, I use the term 'attitude holder' (atheoretically) for the individual whose perspective/attitude the adjective is relativized to.

Although predicates of personal taste have received considerable attention in theoretical semantics, to the best of my knowledge, current semantic theories do not make distinctions based on sensory modality (sight, sound, taste, smell, touch). Thus, a sentence such as *It was disgusting* would presumably be analyzed the same way semantically regardless of whether it refers to the taste, smell or visual appearance of a pizza slice, for example. (But see McNally & Stojanovic 2017 on the challenges of aesthetic predicates like *beautiful*.) In this paper, I report two psycholinguistic experiments that investigate whether the identification of the attitude holder of subjective adjectives (specifically, predicates of personal taste) is influenced by the sensory modality that the adjective makes reference to. To see why one might expect sensory modalities to differ, I first review prior work on the biological and social properties of different senses.

### 1.1 Sensory modalities

It is well-known that the five senses (sight, hearing/audition, taste/gustation, touch/feel and smell/olfaction) are fundamentally different, not only in their biological but also their social-

[*] Many thanks are due to Catherine Wang and Gwenyth Portillo-Wightman for their help with stimulus construction and setting up the studies in Qualtrics. Thanks also to the BLS audience for useful comments and feedback. This research is partially supported by NSF grant BCS-1749612 awarded to Elsi Kaiser.

communicative aspects and general level of subjectivity. In this section, I review the properties of vision, taste and smell, the senses that investigated in the experiments reported here.

**Sight** is commonly viewed as the dominant sense in most (if not all) human cultures and languages (e.g. San Roque et al. 2015, but contra Aikhenvald & Storch 2013). Biologically, vision is a highly specialized sense in humans, and by some estimates, up to 50% of the cortex is involved in visual functions (Palmer 1999). Research on sensory dominance effects suggests that visual input tends to dominate over auditory input when the two conflict (Colavita 1974, Sinnett et al., 2007, Spence 2009) – in other words, human may have a biologically hardwired preference to rely on the visual modality (but see Aglioti & Pazzaglia 2010).

In addition to these biological factors, the primacy of the visual modality may stem from the fact that it often involves SHARED PERCEPTUAL EXPERIENCES between people. As noted by San Roque et al. (2015), "As a distal sense, it seems likely that sight is one of the most readily and regularly shared perceptual experiences among interlocutors" (p.50). They also note that visual cues are generally viewed as the basic foundation for joint attention (e.g. Moore and Dunham 1995). Furthermore, vision is viewed as providing relatively OBJECTIVE information: Sweetser (1990) claims that vision is "our primary source of objective data about the world" (p.39). Not surprisingly, visual evidence is often considered as more reliable than auditory or other kinds of evidence (e.g. in grammaticalized evidentiality systems).

In contrast, the **olfactory (smell) and gustatory (taste) modality** are regarded as more subjective and variable across people (e.g. Sweetser 1990, Chafe & Nichols 1986, Dubois 2007, Viberg 1984). Caballero and Paradis (2015) note that the Reliability Hierarchy of Evidentiality, which ranks the reliability of sensory experiences, states that "in contrast to the relatively objective and stable nature of visual elements in the world, the perceptions of smell, taste and touch are HIGHLY SUBJECTIVE AND VARIABLE ACROSS HUMAN BEINGS" (e.g. Chafe & Nichols 1986, Viberg 1984, 2001). Thus, in contrast to the visual domain (where a person A will tend to assume that she has roughly the same visual experience as person B when they focus their visual attention on the same thing), in the domain of taste or smell A is less likely to assume that she has the same gustatory or olfactory experience as B when they eat or smell the same thing.

### 1.2 Predicates of personal taste and the importance of experience

Prior theoretical work on predicates of personal taste has largely focused on the question of how

to linguistically represent the fact that the meaning of these adjectives is relativized/anchored to the opinion or perspective of an evaluator/judge/attitude holder (e.g., Lasersohn 2005, Stephenson 2007, Patel-Grosz 2012, Pearson 2013). In recent work, researchers have also started to look at how the attitude holder is identified. It is well-known that the speaker is normally the default attitude holder/judge. For example, in 1, the speaker is the preferred attitude holder. However, what about 2, with both a first-person narrator (physically present at the time of the event) and the character in the narrative? Now, the choice of attitude holder is less clear (see Kaiser 2015 for related experimental data):

(1) Speaker says: The muffin was disgusting
Whose opinion is it that the muffin was disgusting? Speaker's OR Addressee's
(2) When I came into the room, Eliza saw the muffin on the platter. It was disgusting.
Whose opinion is it that the muffin was disgusting? The narrator's OR Eliza's

Before taking a closer look at how sensory modality could influence identification of the attitude holder, let us briefly review some of the relevant theoretical work. Recently, it has been argued that predicates of personal taste crucially involve an experiencer argument, in contrast to other kinds of subjective adjectives (e.g. Bylinina 2014; McNally & Stojanovic 2017, see Kaiser & Herron Lee 2017, 2018 for experimental data). In essence, for something to be *fun* or *tasty*, someone must have the relevant experience (usually the speaker). More concretely, as shown in 3 and 4, Bylinina (2014) proposes that with predicates of personal taste, the judge (attitude holder) must be the experiencer of the internal state referred to by the adjective.

(3) JUDGE=EXPERIENCER REQUIREMENT, first take:
A direct statement about someone's internal state can be made only if the judge parameter is set to the same value as the experiencer of this internal state. (Bylinina 2014:58)
(4) $[\![\text{tasty}]\!]^{c;w,t,\mathbf{j}}$ = (i) $\lambda z \lambda x.\ \exists s\ [\mathbf{taste}(s)$ & Experiencer$(s, z)$ & Stimulus$(s, x)$ & TASTE$(s) \succ d_{st}$ for $j$ at $t$ in $w]$; (ii) JUDGE=EXPERIENCER: $j = z$ (Bylinina 2014:52)

### 1.2.1 Identifying the attitude holder(s) in different modalities

In light of the recent findings regarding the importance of the attitude holder having the relevant kind of experience, let us return to the topic of sensory modality. Given that different modalities

involve difference kinds of experiences – and that these experiences can differ in whether they are shared by multiple people or internalized to one person – we might well expect sensory modality to matter for the process of identifying the attitude holder of subjective adjectives. The visual modality often involves shared perceptual experiences between people (e.g. San Roque et al. 2015). Thus, in a context like 5, both the first-person narrator (who enters the room) and Eliza can presumably have the visual experience of seeing the muffin (even though only Eliza is explicitly specified as seeing the muffin). So, when people are asked the *whose opinion* question in 5, both the narrator and Eliza are possible answers (possible attitude holders).

In contrast, the gustatory modality (*taste*) is highly subjective, involves internal experience, and is variable across people (Sweetser 1990). In situation 6, only Eliza tastes the muffin – in all likelihood, the narrator does not have the relevant gustatory experience. Thus, if sensory modality influences how subjective adjectives are interpreted, only Eliza is expected to be available as the attitude holder for 'disgusting' in 6.

(5) When I came into the room, Eliza saw the muffin on the platter. It looked disgusting.
Whose opinion is it that the muffin looked disgusting? The narrator's OR Eliza's
(6) When I came into the room, Eliza tasted the muffin on the platter. It tasted disgusting.
Whose opinion is it that the muffin tasted disgusting? The narrator's OR Eliza's

As regards the olfactory modality, the predictions are less clear. In a situation like 7, Eliza is described as smelling the muffin – but perhaps the narrator (in the same room) can also detect the scent of the muffin. Like vision, smell can occur at a distance and the experience can be shared by multiple people at the same time. Thus, both the narrator or Eliza may be possible attitude holders in 7. However, it is generally assumed that the gustatory modality patterns more like taste in being highly subjective and variable across people (Section 1.1), which may argue against the narrator being available as an attitude holder in 7.

(7) When I came into the room, Eliza smelled the muffin on the platter. It smelled disgusting.
Whose opinion is it that the muffin smelled disgusting? The narrator's OR Eliza's

In sum, while visual input is easily simultaneously experienced by multiple people, taste is more likely to be an internal, individual experience. Additionally, it has been claimed that

visual information is treated as more objective and taste-based information as more subjective. Olfactory input seems to lie somewhere in between the shared nature of visual input and the internal nature of gustatory input. The next section describes an experiment that investigated whether people's interpretation of subjective adjectives is influenced by these socio-biological differences between sensory modalities.

## 2 Experiment 1

Given the striking differences between sensory modalities, two studies were conducted to test whether interpretation of subjective evaluative adjectives (specifically, predicates of personal taste) depends on whether they refer to the visual vs. olfactory (smell) vs. gustatory (taste) domains. Given the sociobiological differences between senses (in particular the shared vs. private nature of the experience) and recent theoretical claims about the importance of the attitude holder being an experiencer, the experiment tested if interpretation of subjective adjectives – specifically, identification of who is the attitude holder – depends on whether they refer to the visual vs. olfactory (smell) vs. gustatory (taste) domains. The experiments reported here focus on vision, smell and taste. They do not investigate hearing/audition and touch, due to challenges associated with incorporating those senses into the within-items experimental design.

### 2.1 Methods: Participants, design and procedure

Native English speakers (n=56) read two-sentence sequences similar to the examples above and answered questions about them. The study was conducted over the internet and the stimulus items were presented in writing. Participants were told to imagine they were reading extracts from novels, and the term 'narrator' was explained as part of the instructions. The critical sequence of clauses was preceded by a subordinate clause that mentions the speaker/narrator by means of a first-person pronoun (ex.8).[1] This makes available two possible candidates (narrator and character e.g. Eliza) for the *whose opinion* question after each target (ex.9) (Note that the question disambiguates *it* as referring to the muffin/relevant object, not the platter or something else.) This question was presented as a two-alternative force choice. The answers provide a measure of who participants think is the attitude holder of the adjective.

[1] Variants where the preamble mentions the third-person character rather than the first-person narrator, '*When she came into the room*' were also tested, but those are not relevant here as they do not introduce another referent.

(8) a. *[sight]*
When I came into the room, Eliza saw the muffin on the platter. It looked disgusting.
b. *[smell]*
When I came into the room, Eliza smelled the muffin on the platter. It smelled disgusting.
c. *[taste]*
When I came into the room, Eliza tasted the muffin on the platter. It tasted disgusting.
d. *[baseline]*
When I came into the room, Eliza put the muffin on the platter. It was disgusting.

(9) Whose opinion is it that the muffin {looked/smelled/tasted/was} disgusting?
The narrator's OR Eliza's

The verbs were used to manipulate the senses involved in the item (vision, smell, taste or no sense/baseline).[2] Within an item, the adjective was kept constant. The sense was specified by the verbs in both the first and the last sentences, except for the baseline condition (8d), where it was underspecified. In the baseline, *put* is used to describe the action done by the character in the story, and *is* is used in the second sentence. Thus, no sensory modality is specified. The study included 24 targets (24 different 'vignettes' one of which is shown in 8), which used 12 adjectives (specifically, predicates of personal taste; each used twice), as well as 42 fillers. The items were presented to participants in a Latin-Square design, so that no participant saw more than one version of each item.

### 2.2 Possible outcomes and their implications

Are there differences between the different sensory conditions in terms of who participants interpret as the attitude holder of the adjective, even though the same adjective is used in all four versions of each item? To the best of my knowledge, current semantic theories of predicates of personal taste do not make any direct predictions about sensory modalities. If we find differences between senses, how can these be captured in theories of evaluativity? One possible avenue is to

[2] Sensory experience often involves multiple senses: As noted by Paradis and Eeg-Olofsson (2013), "we cannot taste something without smelling something, and we cannot taste something without feeling something, and over and above everything is the sight of something" (p.17). However, the verb in the question specifies which sensory modality is being asked about (ex.9) to minimize any ambiguity.

assume an underspecified semantics that leaves room for pragmatic, top-down effects stemming from the social and biological differences between the senses. One such approach has been proposed by Kennedy and Willer (2016:17), who did not look at sensory modalities but who make the point, more generally, that subjectivity is a highly context-sensitive, pragmatic phenomenon that "is not to be explained strictly in terms of any particular semantic parameter, implicit argument, or lexical underspecification" (p.17). This view contrasts with other accounts of how to encode the attitude holder of predicates of personal taste (e.g. Lasersohn 2005, who proposes a judge parameter, Bylinina 2014 who argues in favor of implicit arguments), but would allow us to explain potential sensory modality effects without having to complicate the lexical entries of the adjectives themselves.

In addition to the question of WHETHER differences exist, this work also explores WHAT KINDS OF DIFFERENCES we might find: In 8a and 8c, Eliza is the subject of *saw* and *tasted*. Given that gustatory experiences in general involve a person's internal subjective experience and are variable across individuals, the prediction is that Eliza will be interpreted as the attitude holder of *disgusting* in 8c, with *taste*. However, as visual experiences often involve shared perceptual experiences and tend to be more stable/consistent across individuals, the first-person narrator may also be interpreted as the attitude holder for 'disgusting' in 8a, with *see*. Thus, if the attitude-holder identification process with subjective adjectives is sensitive to the sensory information on the verb, there may be more narrator responses (and less character responses) with *see* than *taste*. The predictions for *smell* are unclear: It involves more shared perceptual experiences than *taste* but is intuitively less constant across individuals than *see*.

## 3 Experiment 1 results and discussion

The proportion of 'character's opinion' responses are shown in Figure 1. (The proportion of 'narrator's opinion' responses is the inverse of the 'character opinion' responses, as the study used a two-alternative forced-choice task). The results were analyzed used logistic mixed-effects regression models (lmer), using R (https://www.R-project.org), as they are better suited for this kind of categorical data than ANOVAs.

The baseline condition (no sensory modality specified) elicited mostly 'narrator's opinion' responses and less than 25% 'character's opinion' responses. This is in line with existing claims from the theoretical literature that the speaker (or writer) is the default attitude

holder: In contexts where no sensory modality is specified and the subjective adjective occurs in a sentence with the copular *is*, participants overwhelmingly interpret the first-person narrator as the attitude holder. Indeed, the proportion of character's opinion responses is significantly lower than chance ($\beta$ = -1.415, SE = 0.0298, z = -4.739, $p < 0.0001$). (From-chance analyses were conducted using intercept-only logistic regression models.)

Crucially, however, the default preference to interpret the speaker/writer as the attitude holder of the subjective adjective vanishes in the other three conditions. Once the character in the narrative is described as the subject of sensory verb – whether it is seeing, smelling or tasting – then that character becomes the preferred attitude holder for the subjective adjective. As can be clearly seen in Figure 1, the other three conditions differ strikingly from the baseline. Regardless of which sensory modality is specified, all three conditions elicit a higher-than chance rate of character's opinion responses (taste: $\beta$ = 2.881, SE = 0.764, z = 3.769, $p < 0.001$, smell: $\beta$ = 1.808, SE = 0.393, z = 4.601, $p < 0.0001$, see: $\beta$ = 0.8699, SE = 0.328, z = 2.653, $p < 0.01$).

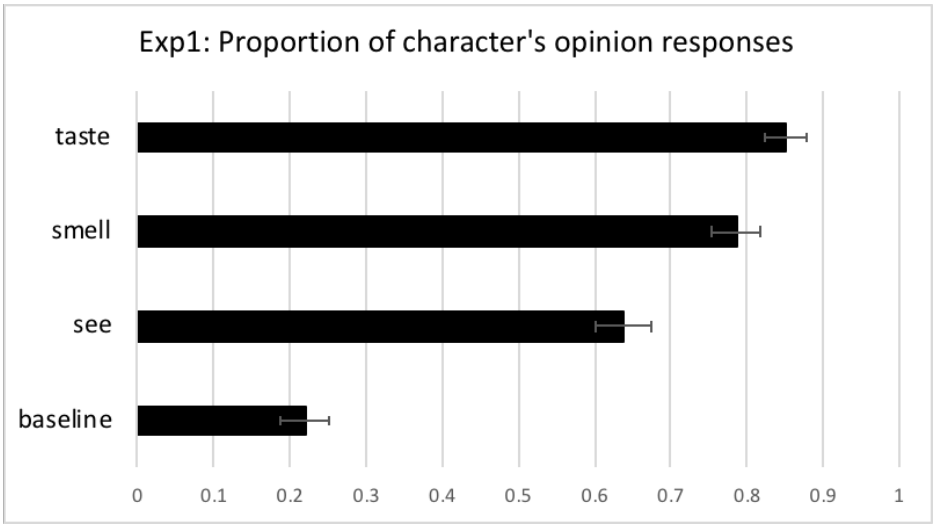


**Figure 1**. Proportion of character's opinion responses in Experiment 1. Error bars show +/- 1 SE. (The proportion of narrator opinion responses is the inverse of character responses.)

Furthermore, when the conditions are compared to each other, we find that the rate of character opinion responses is higher (and the rate of narrator responses lower) in the *smell* and *taste* conditions than the *see* conditions (p's<.003) or the *baseline* condition (p's<.001). (As expected based on Figure 1, the taste and smell conditions do not differ significantly from each other.) Thus, although all three sensory conditions show a preference to interpret the character as

the attitude holder (rather than the narrator), this preference is significantly stronger with *taste* and *smell* than with *see*.

In sum, sensory modality significantly impacts the process of identifying the attitude holder of predicates of personal taste. Contexts involving the gustatory and olfactory modalities elicit more character's opinion responses than contexts involving the visual modality. It is important to acknowledge that the current work was not designed to definitively answer the question of WHY the differences are the way they are – the main aim was to see if differences between modalities EXIST. However, the finding that contexts involving vision elicit significantly fewer character responses (more narrator responses) is in line with observations concerning the shared-experience nature of vision: Not only the character, but also the narrator can be interpreted as the attitude holder of the subjective adjective, as both are receiving and experiencing visual input. The fact that smell and taste pattern alike (and elicit more character responses) is in line with prior claims that these modalities tend to involve more internal (and more subjective) experiences than vision.

## 4 Experiment 2

Experiment 2 builds on Experiment 1, and has two main aims: One aim of this study is to see if linguistic cues (unrelated to sensory modality) can be used to modulate the availability of the speaker/writer as an attitude holder. We saw in Experiment 1 that although the speaker/writer is the preferred attitude holder in the baseline condition (no sensory modality mentioned), once the narrative contains a character who experiences sensory input, the speaker/writer becomes significantly less likely to be construed as the attitude holder. Experiment 2 uses intensifiers (e.g. *totally, absolutely*) to modify adjectives (e.g. *totally disgusting*) to see if this can boost the availability of the speaker/writer as the attitude holder.

The choice of intensifiers is motivated by observations in Beltrama (2018), who discusses uses of *totally* with predicates that do not express a bounded scale. In addition to the traditional examples with predicates that refer to upper-bounded scales like *full* in 10a, *totally* can also be used with adjectives like *awesome* (ex.10b) which do not lexicalize a bounded scale (examples from Beltrama). In these kinds of contexts, "the use of totally contributes to strengthening the speaker's commitment towards the utterance" (Beltrama 2018). In other words, by combining

*totally* with *awesome* – or other open-scale adjectives like *tasty* or *disgusting* – a speaker can signal the strength of their belief that the proposition should be added to the Common Ground.

(10) a. The bus is totally full.
b. Skiing around Salt Lake is totally awesome.

Thus, one could perhaps hypothesize that use of a linguistic expression that strengthens the speaker's commitment towards the utterance would render the speaker more available as an attitude holder, in a context where the speaker (writer) and a character in the narrative are both potentially available as competing attitude holders. This is the idea tested in Experiment 2.

It is important to note that Beltrama focuses on *totally*, which – as he shows – does not behave in the same was as *really*, for example (see Romero and Han 2004 on *really*). Experiment 2 tested a range of intensifiers, to avoid excessive lexical repetition within the experiment. I acknowledge that grouping together multiple intensifiers is likely to be an oversimplification and that further work is needed to better understand the differences between various intensifiers.

The second main aim of Experiment 2 is to see if the basic outcome of Experiment 1 can be replicated with a new group of participants (and stimuli with intensifiers). In recent years, the notion of replicability has gained increasing visibility in psychological and psycholinguistic research. Especially when a new research area is tested experimentally (as is the case here), including some amount of replication is helpful for establishing the credibility of the results.

### 4.1 Methods: Participants, design and procedure

The design, procedure and methods were the same as Experiment 1, except that in all target items, the subjective adjective in the final clause was preceded by an intensifier (e.g. *totally, absolutely, really, extremely)*, as shown in 11. I report data from 56 native English speakers, none of whom had participated in Experiment 1.

(11) a. *[sight]*
When I came into the room, Eliza saw the muffin on the platter. It looked really disgusting.
b. *[smell]* When I came into the room, Eliza smelled the muffin on the platter. It smelled

really disgusting.

c. *[taste]* When I came into the room, Eliza tasted the muffin on the platter. It tasted really disgusting.

d. *[baseline]* When I came into the room, Eliza put the muffin on the platter. It was really disgusting.

(12) Whose opinion is it that the muffin {looked/smelled/tasted/was} really disgusting?
The narrator's OR Eliza's

### 4.2 Possible outcomes

One set of predictions for Experiment 2 parallels those for Experiment 1: If the attitude-holder identification process with evaluative adjectives is sensitive to the sensory information on the verb, we expect to see differences between the sensory modalities – more specifically, we expect to more character responses with *taste* and *smell* than *see*, in line with Experiment 1.

A second set of predictions concerns the potential effects of intensifiers. If intensifiers make the speaker/writer of the sentence (in our case the first-person narrator) more available as an attitude holder, then we expect to see more narrator responses in Experiment 2 than in Experiment 1, at least in contexts where a shared perceptual experience is possible. In other words, in the visual condition – and perhaps in the olfactory condition – we expect to see more 'narrator's opinion' responses in Experiment 2 than in Experiment 1. This is because although the character in the story is described as seeing/smelling the object being described, the first-person narrator is also present in the same space and thus can also experience the gustatory or olfactory sensory input. In the taste condition, which involves an internal experience by the character mentioned in the narrative, it is unlikely that boosting the availability of the narrator will have an effect, as the narrator is not described as being involved in the tasting event.

## 5 Experiment 2 results and discussion

The proportion of trials on which participants answered that the subjective adjective reflects the opinion of the character in the story (rather than the narrator) is shown in Figure 2. As in Experiment 1, the proportion of 'narrator's opinion' responses is the inverse of the 'character's opinion' responses (due to the two-alternative forced-choice design). Similar to Experiment 1, the baseline condition elicits a low proportion of 'character's opinion' responses (significantly

below chance: $\beta = -2.05$, SE = 0.55, $z = -3.73$, $p<.001$). In line with what we saw in Experiment 1, other things being equal, subjective adjectives tend to be interpreted as anchored to the speaker or writer of the sentence (here, the first-person narrator).

The conditions involving the gustatory modality and the olfactory modality elicit a higher-than-chance rate of 'character's opinion' responses (taste: $\beta = 2.235$, SE = 0.553, $z = 4.04$, $p<.0001$), smell: $\beta = 1.122$, SE = 0.382, $z = 2.935$, $p<.001$), in line with Experiment 1. Thus, as we already saw in Experiment 1, when the subjective adjective describes a taste or smell that the character experiences, the character is interpreted as the attitude holder (though smells could in principle be a shared experience between multiple people). The condition involving the visual modality results in an at-chance rate of 'character's opinion' responses and 'narrator's opinion' responses ($\beta = 0.016$, SE = 0.33, $z = 0.048$, $p>.96$).

Indeed, similar to what we saw in Experiment 1, when we compare the conditions to each other, we find that the rate of character opinion responses is higher (and the rate of narrator responses lower) in the *smell* and *taste* conditions than the *see* condition (p's<.001) or the *baseline* condition (p's<.0007). So far, the results for Experiment 2 largely replicate Experiment 1, indicating that (i) participants' interpretation of who is the attitude holder of the subjective adjective depends significantly on the sensory modality and (ii) the gustatory and olfactory modalities have the strongest preference for shifting away from the narrator/writer/speaker to the character in the story. (We discuss the *smell* vs. *taste* comparison below.)

What about potential effects of intensification? The presence of intensifiers was predicted to increase the availability of the narrator as an attitude holder, especially in contexts where shared perceptual experiences are possible, i.e., with *see* and maybe *smell*. Indeed, a comparison of Figures 1 and 2 shows that the rate of narrator responses with *smell* and *see* is higher in Experiment 2 than Experiment 1 (significantly higher with *smell*: $p<.05$, marginally higher with *see*: $p=.052$). There are no significant differences between Experiments 1 and 2 in the baseline condition or the *taste* condition. The differences between Experiments 1 and 2 suggest that intensification can indeed boost the likelihood of the first-person narrator being interpreted as the attitude holder in exactly those modalities where shared experience is possible, i.e., the speaker/writer/narrator can also be an experiencer. Thus, the process of identifying the attitude holder is influenced by multiple constraints, including effects of sensory modality as well as the salience/availability of the first-person narrator.

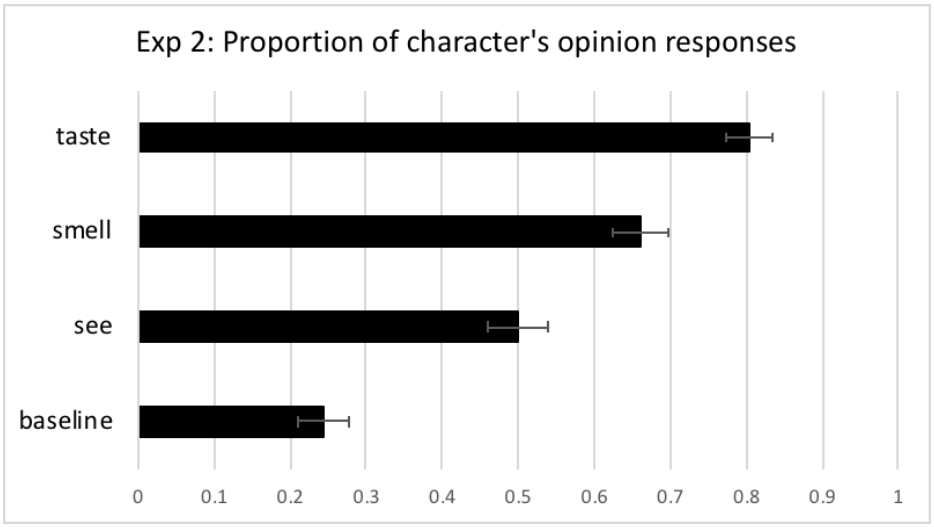


**Figure 2**. Proportion of character's opinion responses in Experiment 2. Error bars show +/- 1 SE.

Potential further evidence for the effects of intensification comes from the finding that (i) though the proportion of character responses in the *smell* and *taste* conditions do not differ in Experiment 1, (ii) *taste* elicits more character responses in Experiment 2 than *smell* ($p<.004$). This difference fits with the finding that in Experiment 2, the proportion of character responses with *smell* is lower than in Experiment 1, since the narrator is more likely to be considered as a potential attitude holder in Experiment 2. This decrease of character responses in Experiment 2 does not occur with *taste*, presumably because taste is an internal, non-shared experience. As a result, a difference emerges between *taste* and *smell* in Experiment 2, further confirming that identification of the attitude holder is sensitive to multiple constraints.

## 6 General discussion

Whereas most prior work on subjective linguistic expressions has focused the question of how to linguistically represent and encode an attitude holder/judge/evaluator for subjective expressions, this paper reports two experiments on how comprehenders identify the attitude holder when multiple candidates are (in principle) available. Specifically, the experiments tested whether, in the case of predicates of personal taste, identification of the attitude holder is modulated by the sensory modality that the situation makes reference to. The studies tested sight, taste and smell, which differ in the social and biological properties of the relevant sensory experience.

The results show that differences in sensory modality significantly impact the process of identifying the attitude holder of subjective adjectives. Participants are more likely to interpret

the first-person narrator as being the attitude holder with *see* when compared to *taste* and *smell*, and conversely are more likely to interpret a character in the narrative as being the attitude holder with *taste* and *smell*, relative to *see*. I tentatively suggest that these findings are likely attributable to the fact that taste and smell are largely internal experiences and vary across individuals (and thus the only plausible attitude holder is the one explicitly described as having the experience), whereas seeing something is a perceptual experience often shared by multiple individuals at the same time (and thus the first-person narrator can also possibly share the experience). Further work is needed to assess these ideas in more detail. As a whole, this work shows that when investigating attitude holders accessible to subjective expressions, one needs to pay attention to the sensory modality involved in the experience.

Furthermore, Experiment 2 found that intensifiers (e.g. *absolutely disgusting*) also influence comprehenders' identification of the attitude holder: In contexts where the perceptual experience can be shared, presence of an intensifier boosts the rate of first-person narrator interpretations. Thus, attitude holder identification is a process guided by multiple constraints, rooted in different linguistic and cognitive sources.

Although theories of predicates of personal taste do not explicitly compare sensory modalities (to the best of my knowledge), they are not incompatible with sensory-modality effects. I view the present results as compatible with claims that the attitude holder (of predicates of personal taste) must be an experiencer (e.g. Bylinina 2014, McNally & Stojanovic 2017). Broadly speaking, if we treat subjectivity as context-dependent (e.g. Kennedy & Willer 2016), we can derive the sense-based differences from the biological and social properties of sight, taste and smell, without needing to complicate the lexical entries of individual subjective adjectives.

**REFERENCES**

AGLIOTI, SALVATORE MARIA, AND MARIELLA PAZZAGLIA, MARIELLA. 2010. Sounds and scents in (social) action. *Trends in Cognitive Sciences* 15(2).47-55.

AIKHENVALD, ALEXANDRA Y., AND ANNE STORCH. 2013. Linguistic expression of perception and cognition: A typological glimpse. In *Perception and cognition in language and culture*, ed. by Alexandra Y. Aikhenvald & Anne Storch (eds.), 1-46. Leiden: Brill

BELTRAMA, ANDREA. 2018. *Totally* Between Subjectivity and Discourse. Exploring the Pragmatic Side of Intensification. *Journal of Semantics*, 35(2).219-261.

BYLININA, LISA. 2014. *The Grammar of Standards.* LOT Dissertation Series.

CABALLERO, ROSARIO, AND CARITA PARADIS. 2015. Making sense of sensory perceptions across languages and cultures. *Functions of Language,* 22(1).1-19.

CHAFE, WALLACE L. AND JOHANNA NICHOLS. (eds.). 1986. *Evidentiality: The linguistic coding of epistemology*. Norwood, NJ: Ablex

COLAVITA, FRANCIS. 1974. Human sensory dominance. *Perception & Psychophysics*, 16.409-12.

DUBOIS, DANIÈLE. 2007. From psychophysics to semiophysics: Categories as acts of meaning. A case study from olfaction and audition back to colors. In *Speaking of colors and odors,* ed. by Martina Plümacher and Peter Holz, 167–185. Amsterdam: Benjamins.

HARRIS, JESSE. 2012. *Processing Perspectives.* Dissertation, UMass.

KAISER, ELSI. 2015. Perspective-shifting and free indirect discourse: Experimental investigations. *Semantics and Linguistic Theory 25*.346-372.

KAISER, ELSI, AND HERRON LEE, JAMIE. 2017. Experience matters: A psycholinguistic investigation of predicates of personal taste. *Semantics and Linguistic Theory* 27.323-339

KAISER, ELSI, AND HERRON LEE, JAMIE. 2018. Predicates of personal taste and multidimensional adjectives: An experimental investigation. *Proceedings of the 35th West Coast Conference on Formal Linguistics (WCCFL35*), 224-231.

KENNEDY, CHRISTOPHER, AND MALTE WILLER. 2016. Subjective attitudes and counterstance contingency. *Semantics and Linguistic Theory* 26.913-933.

LASERSOHN, PETER. 2005. Context dependence, disagreement, and predicates of personal taste'. *Linguistics and Philosophy* 28.643-686

MARKUS, HAZEL, AND ROBERT B. ZAJONC. 1985. The cognitive perspective in social psychology. In *The handbook of social psychology (*3rd ed.), ed. by G. Lindzey & E. Aronson, 137-230. New York: Random House.

MCNALLY, LOUISE, AND ISIDORA STOJANOVIC. 2017. Aesthetic adjectives. In *The Semantics of Aesthetic Judgments*, ed. by James Young, 17-37. Oxford: Oxford University Press.

MOORE, CHRIS, AND PHILIP J. DUNHAM (eds.). 1995. *Joint attention: Its origins and role in development.* Hillsdale, NJ: Erlbaum

PALMER, STEPHEN E. 1999. *Vision science: Photons to phenomenology.* Cambridge: Bradford.

PARADIS, CARITA, AND MATS EEG-OLOFSSON. 2013. Describing sensory experience: The genre of wine reviews. In *Metaphor in and across genres. Thematic issue of Metaphor and* Symbol, ed. By Rosario Caballero, 28(1). 22–40

PATEL-GROSZ, PRITTY. 2012*. (anti-)Locality at the Interfaces.* PhD dissertation, MIT.

PEARSON, HAZEL. 2013. A judge-free semantics for predicates of personal taste. *Journal of Semantics* 30(1).103-154.

POTTS, CHRISTOPHER. 2007. The expressive dimension. *Theoretical Linguistics* 33 (2).165-98.

ROMERO, MARIBEL, AND CHUNG-HYE HAN. 2004. On yes/no questions. *Linguistics and Philosophy* 27.609–658.

SAN ROQUE, LILA ET AL. 2015. Vision verbs dominate in conversation across cultures, but the ranking of non-visual verbs varies. *Cognitive Linguistics* 26(1).31-60

SINNETT, SCOTT; CHARLES SPENCE; AND SALVADOR SOTO-FARACO. 2007. Visual dominance and attention: The Colavita effect revisited. *Perception & Psychophysics,* 69.673–686.

SPENCE, CHARLES. 2009. Explaining the Colavita visual dominance effect. *Progress in Brain Research* 176.245-258.

SWEETSER, EVE. 1990. *From etymology to pragmatics: Metaphorical and cultural aspects of semantic structure.* Cambridge: Cambridge University Press

VIBERG, ÅKE. 1984. The verbs of perception: A typological study. *Linguistics* 21(1).23-62.

VIBERG, ÅKE. 2001. Verbs of perception. In *Language typology and language universals,* ed. by Martin Haspelmath et al., 1294-1309. Berlin: de Gruyter.