The role of context on the suppression of belief inferences from appearance verbs:

Evidence from eye tracking and individual differences

This study examines a psycholinguistic explanation of fallacies of equivocation and addresses three larger questions about polysemy processing: (1) How do default comprehension inferences contribute to the processing of polysemes? (2) How strongly do default inferences from polysemous verbs influence comprehension, and do they occur despite conflicting context? (3) What individual differences modulate the impact of context on these inferences? Three experiments combined plausibility ratings with eye tracking or individual difference assessments, to address these questions for polysemous appearance verbs, which play a key role in philosophical debates, but have received little attention in psycholinguistics. We argue that verbal reasoning is grounded in automatic language processing and suggest fallacies of equivocation may be partially due to polysemy processing.

Fallacies of equivocation occur, e.g., when people draw inferences supported by a dominant sense of a polysemous word from premises that use this word in an infrequent sense. We focused on fallacies in historically influential philosophical arguments. Arguments from Illusion use polysemous appearance verbs (Robinson, 1994). In their dominant sense ("The car looks small to Claire"), "look", "appear", and "seem" function as subject-raising verbs and attribute to the patient (Claire) attitudes including beliefs about the agent (≈Looking at the car, Claire sees it is small and believes it is small) (Brogaard, 2013). These arguments contain familiar situations of non-veridical perception (e.g., distance and perspective), where no one believes that, say, the object is as small as it appears from that distance. The arguments rely on a subordinate "phenomenal" interpretation of the verb, which cancels belief implications (Maund, 1986). We followed up on the suggestion that the arguments rely on contextually inappropriate default belief inferences (Fischer et al., 2021).

Irregular polysemes initially activate an internally structured representation of semantic information that is used to interpret the word in different senses (e.g., Macgregor et al., 2015; Brocher et al., 2018). Where a subset of the activated information is relevant for interpreting a subordinate use, it will be interpreted by *retaining* relevant information from the activated representation and *suppressing* irrelevant information (Giora, 2012). Where the dominant sense is much more salient than subordinate senses, complete suppression of irrelevant information is difficult (Fischer & Sytsma, 2021). This motivates three hypotheses:

- **H1** Phenomenal uses of appearance verbs are interpreted with the Retention/Suppression Strategy.
- **H2** Phenomenal uses of appearance verbs trigger belief inferences that are supported only by the dominant sense.
- **H3** Belief inferences triggered by phenomenal uses influence comprehension.

Three studies examined **H1**-**H3**, and whether **H2**-**H3** hold even when the verb is *preceded* by disambiguating context that suggests a phenomenal interpretation, namely, by specifying non-veridical viewing conditions. Norming studies identified familiar conditions of veridical perception (where, things look their true size, shape, or colour), non-veridical perception (where things look different), and 'neutral' conditions (where one cannot tell either way).

In two eye-tracking experiments, participants read three-sentence stimuli and rated their plausibility. In a within-subjects 2×2 design, we manipulated veridicality in the first sentence and consistency with the belief inference ('small' vs 'large', see example below) in the third sentence. Experiment 1 (N=45) contrasted non-veridical with veridical contexts. Experiment 2

(N=48) contrasted non-veridical with 'neutral' contexts. We measured reading times in five regions.

Table 1. *Regions of Interest*
The car in the valley was far away[1]. It looked[2] small[3] to Claire[4]. She believed it was large[5].
[1]Pre-verbal context [2]Source verb [3]Source adjective [4]Source object [5]Conflict adjective

H1 predicts higher rereading times on the source verb, when given a phenomenal vs dominant interpretation. **H2** predicts higher rereading times in the inconsistent vs. consistent condition for the source and conflict regions. **H3** predicts lower plausibility ratings for items in the inconsistent than consistent conditions.

For **H1**, we compared rereading times between participants who achieved a phenomenal interpretation (evidenced by giving higher plausibility ratings for inconsistent than consistent items in the non-veridical condition) and the remaining participants. In Experiment 1, too few participants responded that way. In Experiment 2, we found a main effect of group at the source verb: t=-2.16, p<.05 and the source adjective: t=-2.24, p<.05), indicating that "phenomenal interpreters" went back and reread the second sentence more.

Rereading times also supported **H2**, with main effects of consistency (INCON > CON) for both source verb (Exp.1: t=3.32, p=.002; Exp.2: t=1.83, p=.07 and for source adjective t=3.11, p=.002 and source object t=-2.40, p=.02, and for conflict adjective (Exp.1: t=2.94, p=.005; Exp.2: t=2.36, p=.02).

Plausibility ratings showed a context x consistency interaction. In Exp.1, mean ratings were INCON < CON, for both veridical and non-veridical contexts, as predicted by **H3**. In Exp.2, this difference was observed only for neutral. Since Exp.1 and 2 used the same non-veridical items, we inferred that the more difficult neutral items acted as reflection prompts promoting deeper processing (Alter et al., 2013). Total reading times supported this suggestion. We further inferred that in this more difficult task setting only the more reflective participants managed to suppress belief inferences.

Experiment 3 (N=99) combined the plausibility rating task from Experiment 2 with individual differences measures (Need for Cognition NCS, Digit Span, Cognitive Reflection CRT, Stroop) to assess **H3** and **H2**. A factor analysis revealed that NCS and Digit span loaded on one factor, whereas CRT and Stroop loaded on another. **H2** predicts correlations between participants' factor scores for this "reflectiveness-inhibition" factor and plausibility for non-veridical (negative for consistent, positive for inconsistent). **H3** predicts that "unreflective" participants will rate consistent items more plausible than inconsistent items, in both neutral and non-veridical, whereas "reflective" participants will do so in neutral, but not non-veridical. Correlations showed (1) the pattern predicted by **H2** (consistent: -.22*; inconsistent: .27**), and (2) the pattern predicted by **H3** when splitting the sample on the "reflectiveness-and-inhibition" factor.

We conclude: (1) Polysemous appearance verbs are processed with the Retention/Suppression strategy. (2) Belief inferences influence comprehension and occur despite disambiguating context that undermines them. (3) This influence can be mitigated by stimuli reflection prompts and by comprehender's reflectiveness.