Implicatures in Epistemically Uncertain Contexts: What Does the Evidence Tell Us?

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Within the Gricean framework, implicatures are derived through complex reasoning that involves assumptions about the speaker's epistemic state. A well-known example is the scalar implicature. Semantically, "Some apples are ripe" means that at least one apple is ripe; pragmatically, it licenses the inference that the stronger alternative, "All apples are ripe", is false. This inference relies on the Conversational Maxim of Quantity, which assumes that speakers aim to be informative and would use the strongest available alternative (Grice, 1975; Horn, 1984). Crucially, the derivation of the implicature inherently requires the assumption that the speaker is knowledgeable about, or at least has a belief regarding, the truth of the stronger alternative (the *competence assumption*): In other words, if a competent speaker used "some", this implies that they know that "all" is not true (an *epistemic step*) (Geurts, 2010; Sauerland, 2004). Without the competence assumption, the speaker's use of the weaker alternative merely conveys their epistemic ignorance, implying that the speaker has no belief about whether "all" is true or false (*weak* or *primary implicature*).

Notably, in alternative frameworks such as the grammatical account (Chierchia et al., 2012) scalar implicatures can arise through local, lexical strengthening of weak scalar terms without considering the knowledge state of the speaker. Thus, implicatures can be derived even for ignorant speakers (*strong* or *secondary implicature*) and consequently "some" is not expected to be used if "all" happens to be true, irrespectively of the speaker's knowledge state.

Despite rich psycholinguistic research on implicature processing, research on the role of mentalizing in pragmatic inferencing remains limited, and the issue itself is debated (Katsos, 2021). A growing body of evidence shows that attributing knowledge states and communicative intentions to a speaker influences how scalar implicature are derived and processed (Bergen and Grodner, 2012; Dieuleveut et al., 2019; Goodman and Stuhlmüller, 2013; Breheny et al., 2013; Spychalska et al., 2021). For instance, participants derive more implicatures when interacting with a cooperative rather than a competitive interlocutor (Dulcinati, 2018) and adjust their implicature production accordingly (Franke et al., 2019). Porrini et al. (2025) showed that the presence of a knowledgeable interlocutor not only increased implicature derivation overall but also partially enabled priming effects across both lexicalized and ad hoc scales. Several neuroimaging studies have shown that ToM networks (see Carrington and Bailey, 2009) are only selectively engaged in the comprehension of certain types of implicatures, such as verbal irony (Köder and Falkum, 2021; Massaro et al., 2013; Spotorno et al., 2012). Feng et al. (2021) found that the activation pattern shared by ToM was elicited by particularized implicatures, but not by generalized (particularly scalar) ones. By contrast, Kampa et al. (2025) found evidence that ToM-associated networks were activated during scalar inference tasks. Finally, other authors argue that inferential processes that concern the speaker's epistemic perspective are only necessary for deriving implicatures during comprehension but not during production Mognon et al. (2021). According to this Asymmetry Account, while the comprehension of utterances containing "some" requires the hearer to consider the speaker's perspective, the production of "some" does not require the speaker to consider the hearer's perspective.

In this talk, I review existing empirical findings and present evidence from my recent EEG studies that directly address how implicatures are processed in epistemically uncertain contexts.

In Experiment 1, using a virtual reality paradigm based on core principles of the Director's Task, we investigated whether listeners incrementally integrate the speaker's perspective while processing scalar implicatures. We contrasted sentences containing the weak quantifier "some" with sentences containing the stronger quantifier "all", in contexts where the speaker had only partial information about the domain, while the listener had full information.

Behavioral responses reflected sensitivity to the speaker's perspective. However, we found no evidence for its early integration during online sentence processing. Instead, only later effects emerged that could be linked to epistemic access. For unambiguous statements with "all", when the listener, but not the speaker, knew

that the sentence was true, the N400 amplitudes were reduced relative to false sentences, irrespective of the speaker's knowledge. By contrast, no significant ERP effects were observed for "some"-sentences. Although behavioral responses indicated that participants derived implicatures in full information scenarios, ERPs for partial-information contexts were not modulated by implicature status or by the speaker's perspective. This pattern suggests that (weak) implicatures were derived only at a relatively late stage of processing.

In Experiments 2 and 3, using a more standard sentence-picture pariadgm, we investigated how readers process assertable and non-assertable quantified statements with "some" and "all" in epistemically uncertain situations. We show that epistemic uncertainty involves processing demands, likely related to inferential context monitoring and reflected in a sustained negativity. While statements that were rejected since they could not be asserted showed elicited an enhanced N400, context effect was primarily observed as late sustained negativity.

We furthermore show differential ERP effects depending on whether participants adopted the weak or strong pragmatic interpretation. Weak implicature appeared to engage epistemic context processing, consistent with the Gricean account. By contrast, as soon as participants inferred the strong implicature, it was lexicalized and the epistemic context played a less prominent role in the processing.

Taken together, these findings suggest that contexts requiring consideration of the speaker's knowledge selectively support Gricean weak implicatures, which are processed late as post-propositional inferences. Moreover, prior reports of scalar implicatures being processed similarly to semantic content may partly reflect artifacts of specific experimental paradigms and tasks, such as truth-value judgment tasks.

Finally, while controlled experiments inevitably involve some degree of artificiality, future research on pragmatics should move beyond isolated contexts and incorporate genuine communicative interaction. Because pragmatic phenomena are inherently tied to communication between individuals, they should be investigated in settings that include at least minimal forms of interactive exchange.

References

Bergen, L. and Grodner, D. (2012). Speaker knowledge influences the comprehension of pragmatic inferences. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 38(5):1450–60. https://doi.org/10.1037/a0027850.

Breheny, R., Ferguson, H. J., and Katsos, N. (2013). Taking the epistemic step: Toward a model of on-line access to conversational implicatures. *Cognition*, 126(3):423–40. https://doi.org/10.1016/j.cognition.2012.11.012.

Carrington, S. J. and Bailey, A. J. (2009). Are there theory of mind regions in the brain? A review of the neuroimaging literature. *Human Brain Mapping*, 30(8):2313–2335. https://doi.org/10.1002/hbm.20671.

Chierchia, G., Fox, D., and Spector, B. (2012). Scalar implicature as a grammatical phenomenon. In Portner, P., Maienborn, C., and von Heusinger, K., editors, *Semantics: An International Handbook of Natural Language Meaning*, volume 3, pages 2297–2331. Mouton de Gruyter.

Dieuleveut, A., Chemla, E., and Spector, B. (2019). Distinctions between primary and secondary scalar implicatures. *Journal of Memory and Language*, 106:150–171. https://doi.org/10.1016/j.jml.2019.02.008.

Dulcinati, G. (2018). *Cooperation and pragmatic inferences*. PhD thesis, UCL (University College London). https://discovery.ucl.ac.uk/id/eprint/10053950/.

Feng, W., Yu, H., and Zhou, X. (2021). Understanding particularized and generalized conversational implicatures: Is theory-of-mind necessary? *Brain and Language*, 212:104878. https://doi.org/10.1016/j.bandl.2020.104878.

Franke, M., Dulcinati, G., and Pouscoulous, N. (2019). Strategies of deception: Under-informativity, uninformativity, and lies—misleading with different kinds of implicature. *Topics in Cognitive Science*, 12(2):583–607. https://doi.org/10.1111/tops.12456.

Geurts, B. (2010). *Quantity Implicatures*. Cambridge University Press. https://doi.org/10.1017/CBO9780511975158.

Goodman, N. D. and Stuhlmüller, A. (2013). Knowledge and implicature: Modeling language understanding as social cognition. *Topics in Cognitive Science*, 5:173–184. https://doi.org/10.1111/tops.12007.

Grice, H. P. (1975). Logic and Conversation. In Cole, P. and Morgan, J. L., editors, *Syntax and Semantics*, volume 3 of *Speech Acts*, pages 41–58. Academic Press, New York. Reprinted in *Studies in the Way of Words*.

Horn, L. R. (1984). Toward a new taxonomy for pragmatic inference: Q-based and R-based implicature. In Schiffrin, D., editor, *Meaning, Form, and Use in Context: Linguistic Applications*, pages 11–42. Georgetown University Press.

Kampa, A. F., Papafragou, A., and Jasińska, K. K. (2025). Scalar inference is supported by theory of mind networks in adults and children. *Language, Cognition and Neuroscience*, pages 1–21. https://doi.org/10.1080/23273798.2025.2489602.

Katsos (2021). The implicature and perspective-taking task : A novel way of investigating the relation between pragmatics and mind-reading. *Cambridge Occasional Papers in Linguistics*, 13(7):144–157. https://www.mmll.cam.ac.uk/files/copil_13_7_katsos.pdf.

Köder, F. and Falkum, I. L. (2021). Irony and perspective-taking in children: The roles of norm violations and tone of voice. *Frontiers in Psychology*, 12:624604. https://doi.org/10.3389/fpsyg.2021.624604.

Massaro, D., Valle, A., and Marchetti, A. (2013). Irony and second-order false belief in children: What changes when mothers rather than siblings speak? *European Journal of Developmental Psychology*, 10(3):301–317. https://doi.org/10.1080/17405629.2012.672272.

Mognon, I., Sprenger, S. A., Kuijper, S. J., and Hendriks, P. (2021). Complex inferential processes are needed for implicature comprehension, but not for implicature production. *Frontiers in Psychology*, 11:556667. https://doi.org/10.3389/fpsyg.2020.556667.

Porrini, A. T., Surian, L., and Pouscoulous, N. (2025). How speaker cooperation and knowledge prime scalar implicatures. *Language and Cognition*, 17:e75. https://doi.org/10.1017/langcog.2025.10025.

Sauerland, U. (2004). Scalar implicatures in complex sentences. *Linguistics and Philosophy*, 27(3):367–391. https://doi.org/10.1023/B:LING.0000023378.71748.db.

Spotorno, N., Koun, E., Prado, J., Van Der Henst, J.-B., and Noveck, I. A. (2012). Neural evidence that utterance-processing entails mentalizing: The case of irony. *NeuroImage*, 63(1):25–39. https://doi.org/10.1016/j.neuroimage.2012.06.046.

Spychalska, M., Reimer, L., Schumacher, P. B., and Werning, M. (2021). The cost of the epistemic step: Investigating scalar implicatures in full and partial information contexts. *Frontiers in Psychology*, 12:2133. https://doi.org/10.3389/fpsyg.2021.679491.