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Experimentally assessing the symmetry of presupposition filtering across disjunction

1. Introduction. We present an experimental investigation of disjunction as a presupposition filter. We focus on sentences of the form $\ulcorner$ not p' or q_p $\urcorner$ (*neg-first* order) and $\ulcorner$ q_p or not p' $\urcorner$ (*neg-second* order) where q_p is a sentence that presupposes p and p' entails p. The sentences in (1), due to B. Partee, exemplify these two schema, with p = *There is a bathroom*, q_p = *The bathroom is upstairs* and p' = p, and since they do not presuppose p, they suggest that in such configurations the presupposition is filtered out.

(1)   a.   Either there is no bathroom, or the bathroom is upstairs.
        b.   Either the bathroom is upstairs, or there is no bathroom.

However, this observation is by itself inconclusive. In these cases, projecting the presupposition (*there is a bathroom*) conflicts with the fact that the author of a disjunction is understood to be ignorant of the truth-value of each disjunct, which in this case means not knowing whether there is a bathroom (see [1]). Current theories of presupposition typically incorporate a mechanism of *local accommodation* [2] which allows presuppositions not to project (even in configurations where they normally would) if they conflict with other inferences. Once such a mechanism is admitted, the fact that (1) does not intuitively presuppose that there is a bathroom is compatible with three mutually incompatible hypotheses:

(2)   a.   (H1): Symmetric Filtering - In both orders p is filtered out
        b.   (H2): Asymmetric Filtering - p is filtered out in the neg-first order, but not the neg-second order (with local accommodation available in the neg-second order)
        c.   (H3): No filtering (with local accommodation still available in both directions).

While [3,4] provide on-line processing evidence in favor of an incremental parsing (asymmetric) view, more recent work [5] suggests the interpretation of (1-b) does not display the signature of local accommodation any more than it does in the case of (1-a), and argues on this basis in favour of (H1).

We aim to adjudicate between the three hypotheses in a more direct manner, by directly investigating the perceived presupposition of the relevant sentences in cases where p' *asymmetrically* entails p, as in (3):

(3)   a.   Either Mary doesn't live in Paris, or John knows she lives in France.
        b.   Either John knows that Mary lives in France, or she does not live in Paris.

Since it is possible to believe p (*Mary lives in France*) while being unsure about p' (*Mary lives in Paris*), there is no pressure to locally accommodate p in (3). Under H1 both sentences are predicted not to presuppose p. Under H2, (3-a) but not (3-b) is predicted to presuppose p. Under H3, both are predicted to presuppose p.

2. Exp 1 - Design. The first experiment had four target conditions, formed from two factors in a 2x2 design: **entailment pattern** and **disjunct order**. These are captured schematically as in Table 1.

The experiment consisted of an inference task, asking participants whether the speakers in an overheard discourse believe a particular presupposition. In addition to the target items, we included baselines with no entailment between the presupposition and the non-

	Neg First	Neg Second
Mutual Entailment	not p or q_p	q_p or not p
Asymmetric Entailment	not p_+ or q_p	q_p or not p_+

Table 1: Schema for target conditions

presuppositional disjunct, which predicts reliably high rates of inference of belief in the presupposition, regardless of theory. The experiment included 9 basic items, each of which was presented in each target and baseline condition, for a total of 36 targets, and 18 baselines. In addition to these, we included 6 fillers and 12 controls. The fillers were conditional sentences with no presupposition trigger, and the controls were conditionals with a presupposition trigger in the antecedent, where participants are always expected to infer belief in the presupposition. We recruited 50 participants through Prolific. The experiment was built and hosted online using PCIbexFarm. As a general measure, we planned to exclude any participant who missed more than 75% of the included controls. Using this measure we excluded 8 participants.

3. Predictions. Each of the hypotheses in (2) makes different predictions for the *proper entailment* items: on (H1), inference rates should be low across both disjunct orders, on (H2) inference rates should be higher

in the *neg-second* order, and on (H3) inference rates should be high across both orders.

4. Results. First, the data do not support H2. In the asymmetric entailing condition, not only do we not detect a significant effect for the factor ORDER (logistic regression model with slope for order and random intercepts for subject and item, $p = 0.3657$), but we observe that whatever effect there is goes in the opposite direction of H2's predictions (cf. Fig. 1) Second, in this condition, the inference rate was high (in favor of H3), but not at the no-filtering baseline (in favour of H1). This intermediate rating suggests filtering does occur, but not systematically. For each comparison, we subset the data to include only the relevant conditions (Model 1: mutual v. asymmetric & Model 2: asymmetric v. baseline) and fit a logistic regression model with random intercepts for subject and

Figure 1: Exp. 01 results - Inference rate by condition

item-frame, and slopes for entailment by subject and by item-frame. In each case we observe a significant effect of the factor ENTAILMENT (Model 1: $p < 0.001$, Model 2: $p = 0.0357$).
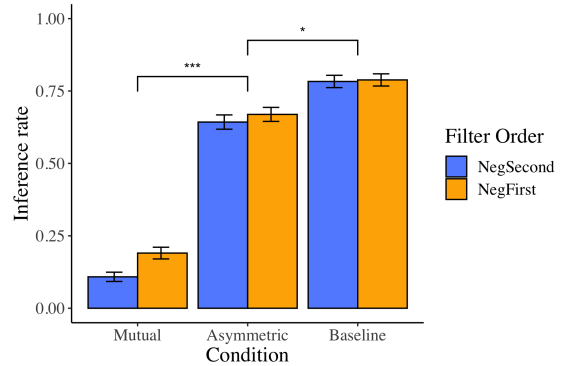
5. Follow-up. Our data appear to rule out H2, but are not fully compatible with H1 or H3. One possibility is that filtering is possible but optional, along the lines of [7]. But it may also be that H1 or H3 is correct and some extra factor explains why inference rates are intermediate. We ran a follow-up experiment to determine if the following hypothesis might be tenable: H1 is correct, but sometimes it is hard to realize that the *negation* of *not p_+* entails p, in which case filtering does not occur. To assess this, we used a reasoning task isolating the relevant logical relations. A sample item from the second experiment is shown in (4).

(4)   Exp. 2 - Negation and Entailment
    a.   Mary believes Ellen does not live in Paris.
    b.   John believes Ellen lives in France.
    c.   Prompt: Mary is wrong. Is John right?

This design is meant to capture the potential difficulty that participants face in seeing that the negation of *not p_+* (Ellen does not live in Paris) entails p (Ellen lives in Paris). This experiment included two target conditions, varying the entailment [mutual, asymmetric] of the negated subexpression. It was found that participants ($n = 54$, recruited on Prolific) exhibited greater difficulty in identifying the correct response in asymmetric items (correct response rate: 42.5%), as opposed to the mutually entailing items (correct response rate: 83.3%). The 9 items used in Exp. 2 match those of Exp. 1. We assessed whether the performance on Exp. 2 in the asymmetric condition could be used to predict the responses in Exp. 1 for the asymmetric entailing condition, using the average response for each item (item-score) in Exp. 2. Fitting a logistic regression model with item-score in Exp. 2 as the predictor and the response in Exp. 1 as the response variable, we find a significant effect of the item-score ($p < 0.001$). However, the small number of items (9), limits our ability to generalize from these results, but suggests a promising direction for future research. H1 may be correct, with filtering modulated by difficulty detecting the relevant entailment relation.

Selected references. [1] Gazdar, G. 1979. *Pragmatics: implicature, presupposition, and logical form.* [2] Heim, I. (1983). On the projection problem for presuppositions. [3] Hirsch, A., & Hackl, M. (2014). Incremental presupposition evaluation in disjunction. NELS44. [4] Hirsch, A., Zehr, J., & Schwarz, F. (2018). Presupposition projection from disjunction in online processing. SuB21. [5] Kalmoiros, A., & Schwarz, F. (2023). Presupposition projection from 'and' vs. 'or': Experimental data and theoretical implications. J. of Sem. [6] Mandelkern, M., Zehr, J., Romoli, J., & Schwarz, F. (2020). We've discovered that projection across conjunction is asymmetric (and it is!). L&P. [7] Van der Sandt, R. (1992) Presupposition projection as anaphora resolution. J of Sem.