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Accounting for free choice: Revisiting the challenge for the implicature approach

Background: A sentence containing disjunction in the scope of a possibility modal, such as (1-a), gives rise to the FREE CHOICE inference in (1-b). This inference presents a well known puzzle in light of standard treatments of modals and disjunction (Kamp 1974 and much subsequent work). To complicate things further, FREE CHOICE tends to disappear under negation: (2-a) doesn't merely convey the negation of (1-a), but rather the stronger DOUBLE PROHIBITION reading in (2-b). A prominent approach to the FREE CHOICE-DOUBLE PROHIBITION pattern is based on a standard meaning of modals and disjunction and generates FREE CHOICE as an implicature (Fox 2007, Klinedinst 2007, Romoli & Santorio 2018, Bar-Lev 2018, a.o.). This approach successfully captures the basic pattern and a variety of more complex data points related to free choice, but has recently been challenged by experimental data presented in Tieu, Bill, and Romoli (2019) (hereafter 'TBR').

The challenge: To illustrate, consider a context like Fig.1, in which Sue is only allowed to buy the hamburger. In this context, the implicature approach predicts a difference in status across the two polarities: the positive (1-a) is literally true, but with a false implicature, while the negative (2-a) is plainly false. TBR investigated this prediction using a ternary judgment task (Katsos Bishop 2011). Participants were presented with sentences like (1-a) and (2-a) as uttered by a puppet and their task was to reward the puppet with a small, medium, or large strawberry, depending on whether the sentence was completely right, completely wrong, or neither. TBR reported that participants primarily selected the intermediate reward for both the positive (1-a) and negative (2-a) in the given context. In contrast, when presented with simple disjunctive sentences like the positive (3-a) and the negative (3-b) in a context where both disjuncts were true, participants exhibited the asymmetric pattern of responses expected on the implicature approach: a preference for the intermediate reward when the (positive) sentence was logically true but with a false implicature, and the minimal reward when the (negative) sentence was plainly false. TBR took the parallel responses to (1-a) and (2-a), combined with the divergent responses in the equivalent disjunction sentences, to pose a challenge for the implicature approach.

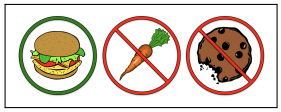

Figure 1: TBR's FC target image, paired with positive and negative FC ((1)-(2)) and CONJUNCTION ((4)) targets in our Exp.1.

Potential confound: TBR's results, however, can also be explained as participants having chosen the intermediate reward in an attempt to be charitable to the puppet. The puppet mentioned two things (the hamburger and the carrot) and she turned out to be right about one of them. So while the sentence on its FC meaning is not compatible with the pictured context, there is a sense in which the puppet's guess was partially right, and this could underlie the reported intermediate responses.

Current study: We report on two experiments that build on TBR's study but which control for the potential confound mentioned above. In Exp.1, we tested TBR's free choice conditions against a corresponding baseline using simple conjunctions. The goal was to test the following prediction of the charitable strategy hypothesis: if the participants selected the intermediate reward in the FC conditions because the puppet was partially right (namely about one of the mentioned items), then given the context in Fig.1, we should observe the same kind of behaviour for simple conjunctions like (4-a) and (4-b). Here everyone agrees, at least for the positive case in (4-a), that the sentence is simply false in the given context. A choice of the intermediate reward, then, would be evidence for the charitable strategy, while a difference between the two conditions would corroborate the challenge for the implicature approach. We furthermore hypothesised that because the disjunctive statements explicitly mentioned two items, they might especially invite the charitable strategy to reward the puppet for getting one of the two things right. So, in Exp.2, we moved to a variant of free choice involving FC 'any', in order to avoid overt disjunctions that would explicitly mention specific items. It was not possible to compare FC 'any' against a 'some' baseline, given the latter's positive polarity properties would make it impossible to test the negative counterpart; hence we decided to compare FC 'any' to the indirect scalar implicature of negated 'every' (*not every but some*). This had two advantages: (i) for both conditions we could compare literally true sentences with false implicatures to literally

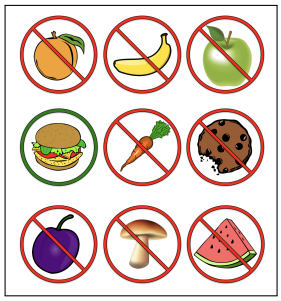

Figure 2: Exp.2 test image paired with positive and negative ANY targets in (5).

false sentences with true implicatures; (ii) the experimental context and visual stimuli could be made comparable (see Fig.2 for an 'any' target; the 'every' targets also featured an array of 9 items, all (LiteralFalse/ImplicatureTrue) or none (LiteralTrue/ImplicatureFalse) of which were circled in green).

Methods: Participants were English native speakers recruited via Amazon Mechanical Turk. We report here on data from 38 participants in Exp.1 (20 FC, 18 CONJUNCTION) and 27 participants in Exp.2 (13 ANY, 14 EVERY), all of whom displayed at least 75% accuracy on unambiguous controls. Participants' task was to decide, given a pictured scenario, whether a puppet's guess had been right ('big strawberry'), wrong ('small strawberry'), or neither ('medium strawberry'). In all, participants saw 8 targets, 8 controls, and 6 fillers.

Results: The results of Exp.1 are presented in Fig.3 (left). Participants' responses to targets qualitatively resembled those in TBR's experiment, with mostly intermediate responses to positive and negative FC targets. Strikingly, the same pattern was observed for the conjunction targets, where no implicature is involved. Cumulative link mixed models with Condition (FC vs. CONJUNCTION), Polarity, and their interaction as fixed effects did not reveal an effect of Condition or interaction ($p > .05$). The results support the suggestion that participants were adopting the aforementioned charitable strategy. Moving to Exp.2 (Fig.3, right), mixed models revealed a significant interaction between Condition and the truth value of the implicature ($^2(1) = 6.3; p < .05$): the status of the implicature had a significant effect on 'every', as expected for a scalar implicature, but not on 'any'.

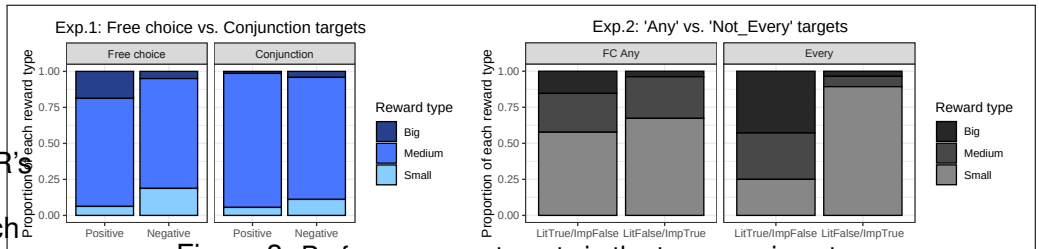

Figure 3: Performance on targets in the two experiments.

Discussion: Our study makes two contributions. First, we investigated a possible confound associated with TBR's challenge to the implicature approach to free choice. We observed a similar pattern of responses for items where no implicature is involved (i.e. (4)), suggesting participants may simply have been responding charitably to the target items (the puppet was right about at least one of the mentioned items). This strategy could have been especially encouraged by the fact that overt disjunction explicitly mentions two items, so we investigated the phenomenon of free choice using 'any', as compared to a(n indirect) scalar implicature baseline. Here we obtain results that converge with TBR's original findings: parallel responses to positive and negative free choice, in contrast to the implicature baseline. The results of Exp.2 clarify the empirical landscape by controlling for the potential confound, and further point us to semantic accounts of free choice like Goldstein (2018), which predicts the observed parallel (undefined) status for positive and negative FC, in contrast to standard cases of implicature.

(1) a. Sue is allowed to buy the hamburger or the carrot.
b. *Sue is allowed to buy the hamburger and she is allowed to buy the carrot*

(2) a. Sue is not allowed to buy the hamburger or the carrot.
b. *Sue is not allowed to buy the hamburger and she is not allowed to buy the carrot*

(3) a. Sue will buy the hamburger or the carrot.
b. Sue will not buy the hamburger or the carrot.

(4) a. Sue will buy the hamburger and the carrot.
b. Sue will not buy the hamburger and the carrot.

(5) a. Sue is allowed to buy any item. b. Sue is not allowed to buy any item.

(6) a. Sue didn't buy every item. *(in 0/9 vs. 9/9 context)*

Selected References

Bar-Lev, M. 2018. Free choice, homogeneity and innocent inclusion. Fox, D. 2007. Free choice and the theory of scalar implicatures. Goldstein, S. 2018. Free choice and homogeneity. Tieu, L., C. Bill & J. Romoli. 2019. Homogeneity or implicature: An experimental investigation of free choice.