

Homogeneity vs. implicature theories of free choice: An experimental study

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Background: A sentence containing disjunction in the scope of a possibility modal (1a) gives rise to a FREE CHOICE inference (1b). This inference is puzzling in light of a standard treatment of modals and disjunction (Kamp 1974 and much subsequent work). To complicate things further, FREE CHOICE tends to disappear under negation: (2a) doesn't merely convey the negation of (1a), but rather the stronger DUAL PROHIBITION reading in (2b). A *homogeneity*-based approach to FREE CHOICE has recently been defended in various forms (Starr 2016, Aloni 2018, Willer 2018, Goldstein 2018, a.o.). Goldstein's (2018) account is based on two main ingredients: (i) a strong meaning for sentences like (1a), which directly asserts FREE CHOICE, and (ii) a homogeneity presupposition requiring that either all alternatives are possible or none of them are. In the positive case, this presupposition is entailed by the FREE CHOICE asserted meaning. Under negation, the asserted meaning is just the negation of FREE CHOICE; the latter, in combination with the homogeneity presupposition (which projects through negation), gives rise to the desired DUAL PROHIBITION reading (see Table 1). The *implicature*-based approach (Fox 2007, Klinedinst 2007, Chemla 2009, Franke 2011, Romoli & Santorio 2018, Bar-Lev 2018, a.o.), on the other hand, is based on three main ingredients: (i) a standard meaning for disjunction and possibility modals, (ii) an implicature-generating algorithm EXH, and (iii) a principle regulating the distribution of EXH (independently required for implicatures more generally), which bans or strongly disprefers EXH under negation (Chierchia et al. 2012, Fox & Spector 2013, a.o.). In the positive case, the literal meaning does not entail FREE CHOICE. However, if EXH is added to the sentence, FREE CHOICE arises as an implicature. Finally, the principle in (iii) prevents EXH from appearing in the scope of negation, and DUAL PROHIBITION arises straightforwardly from the negation of the literal meaning of (1a) (see Table 1).

Predictions: Consider a context like Fig. 1 (left) in which Sue is only allowed to buy the boat. In this context, the homogeneity account predicts both (1a) and (2a) to be undefined, as their presupposition is not satisfied. The implicature account, on the other hand, predicts a difference in status across the two polarities: it predicts (1a) to be literally true, but with a false implicature, while it predicts (2a) to be plainly false. To sharpen the predictions, consider the corresponding simple disjunction: (3a) gives rise to the exclusivity implicature (3b), which disappears under negation (4a). In the context in Fig. 1 (right), in which Sue bought both the boat and the car, (3a) is true but with a false implicature, while (4a) is plainly false. Thus the IMPLICATURE approach predicts a similar pattern for the pairs in (1a)-(2a) and (3a)-(4a), reflecting a falsified implicature in the positive cases versus a falsified literal meaning in the negative ones, while the HOMOGENEITY account predicts a difference between the pairs (an interaction between Inference Type and Polarity), in that (1a) and (2a), unlike (3a) and (4a), are predicted to have the same status (i.e. they are both predicted to be undefined).

Experiment: We used a ternary judgment task (Katsos & Bishop 2011) in 'prediction' mode, in which participants had to read a puppet's guesses about what a character was allowed/not allowed to buy (free choice (FC) condition) or about what a character bought/didn't buy (disjunction (OR) condition) (Fig. 1). They then had to judge upon seeing the outcome how right the puppet had been, by giving her a small, medium, or large strawberry. In the FC condition, the critical positive and negative target sentences (e.g., (1a)-(2a)) were presented in contexts like Fig. 2 (left), in which only one of the disjuncts was 'allowed' (e.g., Sue was only allowed to buy the boat). In the OR condition, the positive and negative disjunctive statements (e.g., (3a)-(4a)) were presented in contexts like Fig. 2 (right), which falsified the exclusivity inference (e.g., Sue bought both the boat and the car). 114 Mechanical Turk workers were randomly assigned to the FC or OR condition; 3 were excluded for not reporting English as a native language, leaving 111 participants for analysis (56 FC, 55 OR). Each participant received 2 training items, followed by 8 targets (4 positive, 4 negative) and 8 controls (2 true and 2 false positive controls, 2 true and 2 false negative ones).

Results: Participants primarily gave the intermediate reward in response to both positive and negative FC targets, while they gave an asymmetric pattern of responses to the positive and negative

OR targets (Fig.2). Cumulative link mixed models with Inference Type, Polarity, and their interaction as fixed effects and random by-participant intercepts for Polarity revealed a marginal effect of Inference Type ($\chi^2(1) = 3.2, p = .07$), a significant effect of Polarity ($\chi^2(1) = 102, p < .001$), and a significant interaction between Inference Type and Polarity ($\chi^2(1) = 88, p < .001$), with participants showing a greater difference between polarities for OR than for FC.

Discussion: The difference between free choice and disjunction is challenging for the IMPLICATURE account, which predicts a similar pattern for the two across polarities. But the results are straightforwardly in line with the HOMOGENEITY account, which predicts (1a) and (2a) to be equally undefined in the given context. One possible approach is to abandon the implicature account altogether. An alternative direction may be to reconsider the principle regulating the distribution of EXH. Enguehard & Chemla (2018), for example, propose a constraint based on a notion of ‘connectedness’ that predicts EXH not to be banned in the scope of negation with FREE CHOICE, while still predicting the standard asymmetry between positive and negative in the case of simple disjunction. Regardless of the theoretical choice pursued, the relative status of the positive versus negative sentences provides an important window into theories of free choice and implicature.

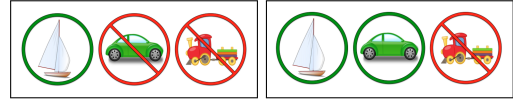


Figure 1: Example visual stimuli: the left image was paired with the positive and negative FC targets in (1a)-(2a); the right image was paired with the positive and negative OR targets in (3a)-(4a).

- (1) a. Sue is allowed to buy the boat or the car.
b. \rightsquigarrow Sue is allowed to buy the boat and Sue is allowed to buy the car FREE CHOICE
- (2) a. Sue is not allowed to buy the boat or the car.
b. \rightsquigarrow Sue is not allowed to buy either one DUAL PROHIBITION
- (3) a. Sue bought the boat or the car.
b. \rightsquigarrow Sue didn't buy both the boat and the car EXCLUSIVITY IMPLICATURE
- (4) a. Sue didn't buy the boat or the car.
b. \rightsquigarrow Sue didn't buy either one NEGATED LITERAL MEANING

	ASSERTED MEANING	PRESUPPOSED MEANING	RESULT
POSITIVE	$\diamond(a \vee c) = \diamond a \wedge \diamond c$	$\diamond a \leftrightarrow \diamond c$	$\diamond a \wedge \diamond c$
NEGATIVE	$\neg \diamond(a \vee c) = \neg(\diamond a \wedge \diamond c)$	$\diamond a \leftrightarrow \diamond c$	$\neg \diamond a \wedge \neg \diamond c$

	LITERAL MEANING	IMPLICATURE	RESULT
POSITIVE	$\diamond(a \vee c) = \diamond a \vee \diamond c$	$\text{EXH}(\diamond(a \vee c)) = \diamond a \wedge \diamond c$	$\diamond a \wedge \diamond c$
NEGATIVE	$\neg \diamond(a \vee c) = \neg \diamond a \wedge \neg \diamond c$	$*\neg(\text{EXH}(\diamond(a \vee c))) = \neg(\diamond a \wedge \diamond c)$	$\neg \diamond a \wedge \neg \diamond c$

Table 1: Derivation of the FREE CHOICE-DUAL PROHIBITION pattern under the HOMOGENEITY account (upper table) and under the IMPLICATURE account (lower table).

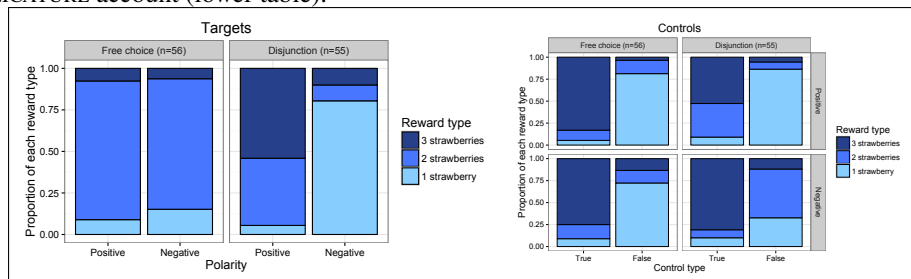


Figure 2: Proportion of reward types in response to targets and controls in FC and OR conditions.

Selected References

Bar-Lev, M. 2018. *Free choice, homogeneity and innocent inclusion*. • Enguehard, I. & Chemla, E. 2018. Connectedness as constraints on exhaustification. • Fox, D. 2007. Free choice and the theory of scalar implicatures. • Goldstein, S. 2018. Free choice and homogeneity. • Katsos, N. & Bishop, D. 2011. Pragmatic tolerance: Implications for the acquisition of informativeness and implicature.