

## Quantifying Non-Implicature Sources of Disjunction Exclusivity

A positive disjunction (A or B) in natural language typically receives one of two logical interpretations: inclusive (A or B or both) or exclusive (A or B but not both). Within the Gricean paradigm, the inclusive interpretation is often considered as the primary meaning of disjunction words such as “or” while the exclusive interpretation is attributed to other factors and mechanisms. It is recognized that both scalar implicatures (Grice, 1978; Horn, 1972; Gazdar, 1980) and prior expectations on the exclusivity/compatibility of the disjuncts (Geurts, 2006) can contribute to exclusivity implications, yet no study so far has measured their respective contributions. We present two experimental studies that first pulls apart the sources of exclusivity in examples used in the disjunction literature (Exp. 1), and second tests the role of the syntactic category of disjuncts and their lengths as a potential source of exclusivity (Exp. 2).

**Experiment 1: Prior Compatibility vs. Scalar Implicatures:** Motivating Experiment 1 is Geurts (2006)’s observation that certain disjuncts cannot co-occur (e.g. The car is in the garage or on the street) and thus must be interpreted exclusively sans any scalar reasoning. Others are merely unlikely to co-occur, e.g. John is singing or screaming. We hypothesized that some amount of exclusivity may stem from this partial incompatibility. First, we collected norming data on the compatibility of the disjuncts in 47 items pulled from published work on exclusive disjunction (Example 1). N = 50 subjects rated how likely the two separate disjuncts were to be true together from 0% to 100%, aiming to assess compatibility. Next, we exposed a different N = 50 participants to the full disjunctions from the literature and asked them to rate how possible it is that both disjuncts were true based on the sentence they just read, aiming to assess exclusivity. Our results show that prior beliefs about disjunct compatibility were not only highly predictive of exclusivity (R<sup>2</sup> adjusted = 0.488; Figure 1), but also that disjunctions judged by the literature to be exclusive due to scalar implicatures tended to have less compatible disjuncts (Figure 2). This suggests that not only does prior compatibility contribute to the overall exclusivity of a disjunction, it may also play a confounding role in previous theoretical work that has historically assumed scalar implicatures as the primary source of exclusivity. However, we also show that the use of “or” and a disjunction introduces exclusivity above and beyond the prior expectations of the exclusivity of disjuncts, which is most likely due to scalar implicatures.

**Experiment 2: Syntactic Structure and Disjunct Length:** Experiment 2 was motivated by the observation that coordinating clauses (e.g. John likes tea or John likes coffee) tends to imply exclusivity more than coordinating NPs (e.g. John likes tea or coffee) (Jasbi, 2018). Because varying the syntactic category of disjuncts necessarily varies the length of said disjuncts, it was crucial to control for disjunct length as well as the syntactic category of the phrases. 32 disjunction frames were created in the style of Example 2 that varied in syntactic category within items and NP length across items, split into 4 latin square groups so each participant only saw each sentence frame once. N= 60 participants rated the exclusivity of these sentences in the same manner as participants did in Experiment 1. Their data was analyzed using mixed effects linear regression with main effects of syntactic category, disjunct length, and their interaction, and random effects of item, participant, and item by participant. Because the analysis was within items, statistical control for prior compatibility was superfluous. We found no significant effects of either length or syntactic category, suggesting that the syntactic category and length of disjuncts do not introduce a strong and robust exclusivity implication independent of prior compatibility and scalar implicatures.

**Conclusion:** Our results demonstrate that most exclusivity implications are composite implications that feed from minimally 2 sources: prior beliefs about compatibility and scalar implicatures, but that neither the syntactic category of disjuncts nor their length has a consistent effect. These studies also suggest that future work in semantics and pragmatics should be careful not to overestimate the role of scalar implicatures in generating exclusivity implications and pay closer attention to non-implicature sources of exclusivity. Finally, follow-up work should test other potential non-implicature sources of exclusivity, such as prosody (Roelofsen & Pruitt, 2013) and the presence of “*either*”, incorporating them into a comprehensive model that uses

multiple factors in predicting the interpretation of disjunction across contexts. Our results serve as a demonstration of a many-to-one model of pragmatic meaning that complements existing theories of implicature while accounting for non-implicature sources of disjunction exclusivity.

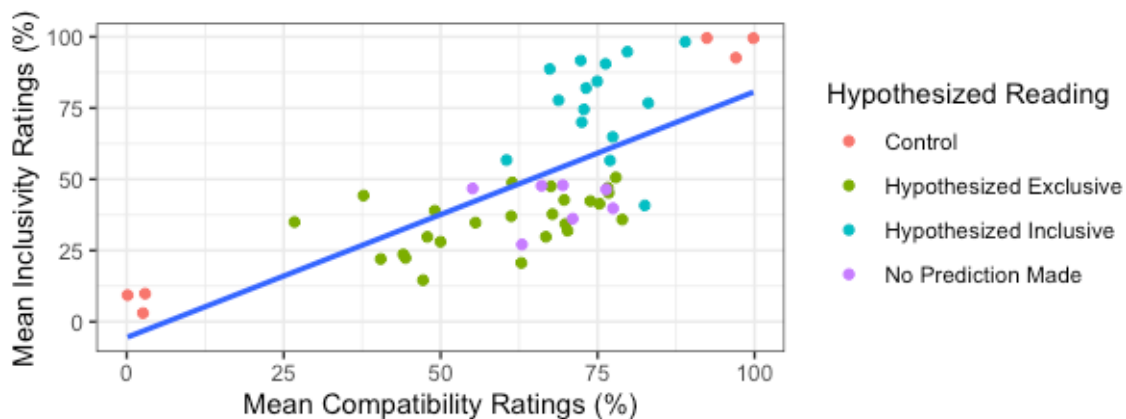
**Example 1: Prior Compatibility Stimuli:**

- (a) "John is singing." (Norming Disjunct A)
- (b) "John is screaming." (Norming Disjunct B)
- (c) "How likely is it that someone is both singing and screaming?" (Compatibility Probe)
- (d) "John is singing or screaming." (Original Disjunction)

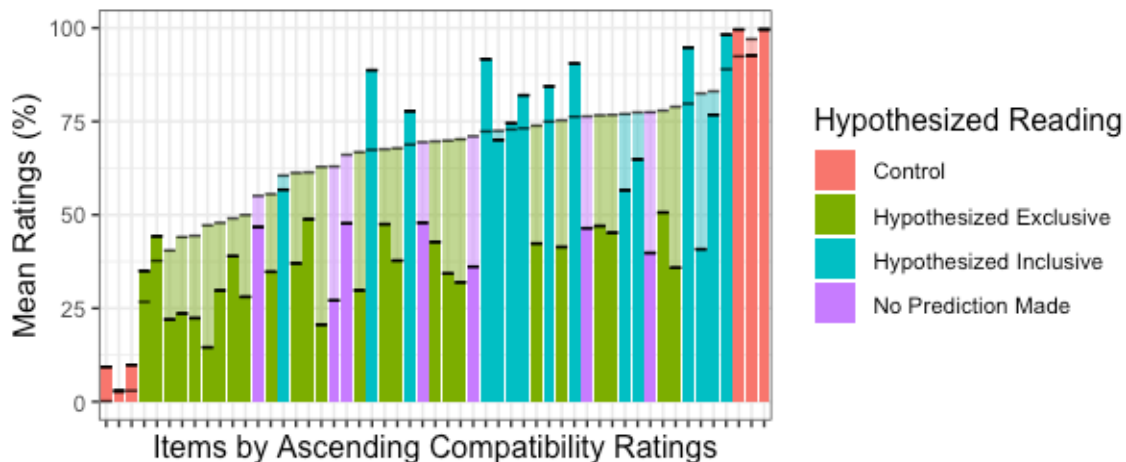
**Example 2: Syntactic Category and Disjunct Length Stimuli**

- "John likes tea or John likes coffee" (Coordinated Clauses+Proper Name, 3 word disjuncts)
  - "John likes tea or he likes coffee" (Coordinated Clauses+Pronoun, 3 word disjuncts)
  - "John likes tea or likes coffee" (Coordinated VPs, 2 word disjuncts)
  - "John likes tea or coffee" (Coordinated NPs, 1 word disjuncts)
- (Stimuli had NPs ranging from 1-8 words)

References: Gazdar, G. (1980). Pragmatics and logical form. *Journal of Pragmatics*, 4(1), 1-13. Geurts, B. (2006). Exclusive disjunction without implicature. [Ms., University of Nijmegen]. Grice, H. P. (1978). Further notes on logic and conversation. In *Pragmatics* (pp. 113-127). Brill. Horn, L. R. (1972). On the semantic properties of logical operators in English. [Doctoral Dissertation, UCLA]. ProQuest Dissertations and Theses. Jasbi, M. (2018) Learning Disjunction. [Doctoral Dissertation, Stanford University]. Stanford Digital Repository. Pruitt, K., & Roelofsen, F. (2013). The interpretation of prosody in disjunctive questions. *Linguistic inquiry*, 44(4), 632-650.



**Figure 1: Correlation Between Compatibility and Inclusivity**



**Figure 2: Change in Item Means Between Tasks (prior compatibility is translucent)**