

Impact of Structural and Affective Factors on Pragmatic Inferences

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Introduction. Previous research by Gotzner et al. (2018) demonstrated a negative correlation between two types of pragmatic inferences: scalar implicatures (SI), where weaker adjectives (e.g., "good") exclude stronger ones (e.g., "excellent"), and negative strengthening (NS), where negated stronger adjectives (e.g., "not excellent") exclude weaker terms (e.g., "good"). This negative correlation indicates that the derivation of one inference often coincides with a reduced likelihood of endorsing the other. They also found that SI and NS are differentially influenced by structural properties of adjective scales: SI is primarily affected by polarity (negative vs. positive) and boundedness (scales with endpoints), whereas NS is more affected by extremeness and the politeness of negated stronger terms. However, the role of these scale properties suggests that a more general psychological factor, affect, may be driving these effects. Affect, which encompasses arousal and valence, is known to drive attention and language processing, yet its role in pragmatic inference remains unexplored. The present study draws on psychological research into affect (e.g., Citron, 2012; van Berkum, 2021; Kensinger & Schacter, 2008) to examine whether arousal and valence influence SI and NS beyond structural predictors.

Methods. We reanalyzed Gotzner et al.'s dataset using stepwise regression, integrating affective ratings from Warriner et al. (2013). This approach assessed the unique contributions of arousal and valence to SI and NS, in addition to the variance explained by the structural factors previously identified (e.g., boundedness, politeness, and extremeness). Our analysis was based on 45 initial pairs, with 8 removed due to missing affect data, leaving 37 adjective pairs.

Results. Consistent with Gotzner et al. (2018), SI and NS were negatively correlated ($r = -.67$, $p < .001$). However, SI and the arousal of the first adjective (Arousal1) were also negatively correlated, ($r = -.347$, $p = .015$), and once we included Arousal1 in the full model predicting SI, the coefficient for NS was no longer a significant predictor ($\beta = -0.184$, $p = 0.298$), and adding NS to the full model with Arousal1 did not improve predictive power ($F(1) = 1.12$, $p = 0.298$) (See Figure 1). The same held true for all partial models, suggesting that NS's role in SI derivation is fully mediated by the arousal of the first adjective. The arousal of the second adjective was only marginally significant in the full model, while valence of the first and second adjectives were not significant predictors, suggesting minimal impact of valence on SI derivation. Structural predictors, including semantic distance, extremeness, and polarity, remained highly significant in all models of SI. Similar analyses of NS derivation indicated that it was primarily driven by structural factors such as semantic distance, extremeness, and boundedness, with negligible contributions from affective dimensions like arousal and valence.

Conclusions. The previously observed negative correlation between SI and NS appears to be driven by a psychological factor, namely the arousal rating of the adjective licensing scalar inferences. In contrast, the arousal of the inferred adjective seems to play a lesser role as does the valence of both adjectives. This suggests that the inferential process is modulated by psychological factors previously unexamined in the context of pragmatic implicatures. Our findings do not refute Gotzner et al.'s framework but instead extend them by showing the unique predictive power of arousal in SI derivation over and above structural predictors such as extremeness. We suspect that the weaker role of the arousal of the second adjective is due to stronger terms serving as fixed reference points, reducing variability in inferential outcomes (Gotzner et al., 2018). While the distinct effects of structural properties on pragmatic inferences are well-established, whether these differences reflect divergent cognitive processes remains unclear. Our findings show that arousal significantly influences SI but not NS, suggesting SI and NS may involve distinct mechanisms or varied applications of shared processes. These results emphasize the need for integrative models that account for both structural and affective dimensions in pragmatic reasoning.

References

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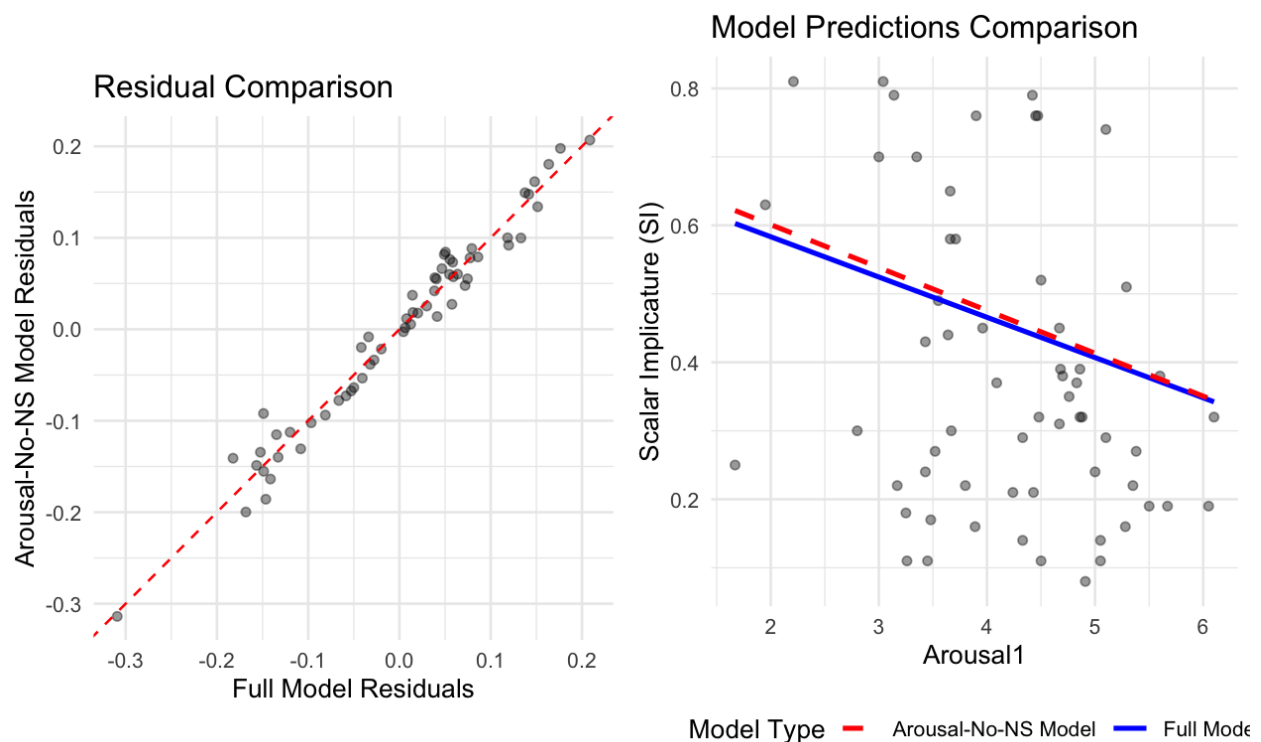


Figure 1: The left panel compares residuals of the Full Model and Model without NS, with alignment along the 45-degree line indicating similar fits. The right panel shows overlapping regression lines, highlighting that both models predict a consistent relationship between the arousal of the first adjective and Scalar Impicature (SI), despite the exclusion of Negative Strengthening (NS) in the second model.