What mechanisms support pronoun interpretation in sentence comprehension? Are semantic association effects a reliable index of this process?

Genevieve traveled with the prince. She wished that his ... 

castle estate

- Previous evidence is mixed: cross-modal priming studies found rapid semantic facilitation effects [1,2,3], while a recent eye-tracking study observed only late effects more consistent with sentence-level integration processes than with rapid antecedent semantic reactivation [4].
- Here we use the N400 amplitude in ERP as a potentially more sensitive measure of associative semantic facilitation.
- We use Bayesian hierarchical linear-mixed models to estimate priming effects [5]. For each effect, we calculated the mean of the posterior distribution, a Bayesian 95% credible interval (the interval where, given the observed data and the model, we can be 95% sure that the true effect lies), and the posterior probability of there being a facilitatory effect (i.e., priming).

Sentence follow-ups

Experiment 2 (n = 32) & 3 (n = 42)

- Some indication of priming with full NPs (mean = -0.35 mV [-1.04, 0.34], P(effect < 0) = 0.84).
- Some indication of priming with pronouns (mean = -0.50 mV [-1.28, 0.27], P(effect < 0) = 0.90).
- In contrast with Experiment 1, no evidence of a difference between related pronouns and the coreference control condition (mean = 0.30 mV [-0.48, 1.05], P(effect < 0) = 0.21).

Experiment 4 (bare case: prince-castle vs. prince-estate) and Experiment 5 (possessive case: prince’s-castle vs. prince’s-estate) evaluated the strength of semantic association N400 effects using a traditional word pair paradigm.

Pooled analysis

- We find no clear N400 evidence for semantic facilitation driven specifically by pronoun interpretation—observed effects are consistent with more general contextual facilitation.
- One explanation is that pronoun interpretation in English only requires contact with discourse representations, and this does not trigger spreading activation through the semantic network [4].
- However, the experiments show that semantic facilitation effects on the N400 are generally reduced by sentence context and by possessive case morphology, suggesting that in this paradigm true pronoun-driven semantic facilitation effects would be small and thus more challenging to detect [6].
- The unexpected effect of morphology on semantic priming is independently interesting and merits future work.