Disentangling effects of social context on lexico-semantic processing

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Background: Recent studies have reported a "social N400" effect, whereby comprehenders show N400-like ERP responses to sentence continuations that are plausible for themselves but expected to be implausible for a partner. This effect has been observed in a joint sentence comprehension paradigm [1,2], in which participants hear an auditory context sentence, followed by a critical sentence on a screen. Intriguingly, when reading alongside a partner who lacks access to the supportive context and tracking the partner's understanding, participants show an enhanced N400, despite experiencing no apparent semantic processing load themselves. This suggests a sensitivity to the partner's expected semantic processing difficulty; effectively producing an N400 "on behalf of" the other person. However, prior studies have confounded the partner's knowledge state with their mere co-presence, leaving open whether the effect reflects partner modelling or more general social-contextual influences on language processing. Independent work suggests that the mere presence of another person may automatically modulate N400 amplitudes, e.g. [3], although evidence for this is mixed [4]. To dissociate these accounts, we independently manipulated partner presence and shared knowledge in a preregistered EEG study, extending the paradigm of [1,2].

Method: Participants (N=39, M age=20, range=18-29) judged the plausibility of critical sentences across three conditions (99 stimulus triplets): Plausible; Implausible; and Context-dependent, which were expected and plausible only given the preceding auditory context. They completed three blocks: Alone; Hearing Partner (with a co-present partner who also heard the auditory context); and Non-hearing Partner (where the same partner lacked access to the context). Block order was counterbalanced. In both joint blocks, participants judged whether the critical sentence would make sense to the partner, holding co-presence and judgements constant and varying only the partner's knowledge state.

Results: We pre-registered a set of mixed effect regressions fit to single-trial N400 amplitudes (350-550ms, centro-parietal ROI). We observed robust canonical lexico-semantic N400 effects (Implausible > Plausible, all $p<.02$). By contrast, we found no evidence for a general mere-presence effect (Hearing vs. Alone: $\beta=0.16$, $p=.72$), nor for the predicted "social N400": the Context-dependent vs. Plausible contrast did not increase reliably in Non-hearing Partner relative to Alone, when the EEG participant was aware that the partner lacked the critical context (interaction: $\beta=-0.44$, $p=.39$). A direct comparison of the two joint blocks revealed a difference in the Context-dependent–Plausible contrast (interaction: $\beta=-1.06$, $p=.042$); however, follow-up analyses confirmed that this was primarily driven by an unexpected positivity for Context-dependent trials in the Hearing Partner condition, rather than a reliably increased negativity in Non-hearing Partner.

Discussion: Recent work has suggested that the "social N400" may index processing sensitive to a co-present partner's differing knowledge state. We sought to replicate this effect while evaluating whether it could instead be explained by the mere presence of a partner, rather than differences in their knowledge state. Unexpectedly, we found no evidence for such an effect, raising the possibility that prior findings may be less robust than previously suggested. However, our design necessarily differs from earlier studies, and we are therefore currently testing these ideas in an in-progress direct replication of the original social N400 findings.

Table 1. Sample item. Critical word in bold. Context sentences were presented via headphones; critical sentences were presented visually (RSVP).

Condition	Context sentence	Critical sentence
Plausible	The Joker, Batman's enemy, had wild clown hair and make-up.	The Joker's hair was **green** and brown.
Implausible	The old barrister was on his way to work.	The lawyer's hair was **green** and brown.
Context-dependent	The passionate environmental lawyer dyed his hair the colour of fresh moss.	The lawyer's hair was **green** and brown.

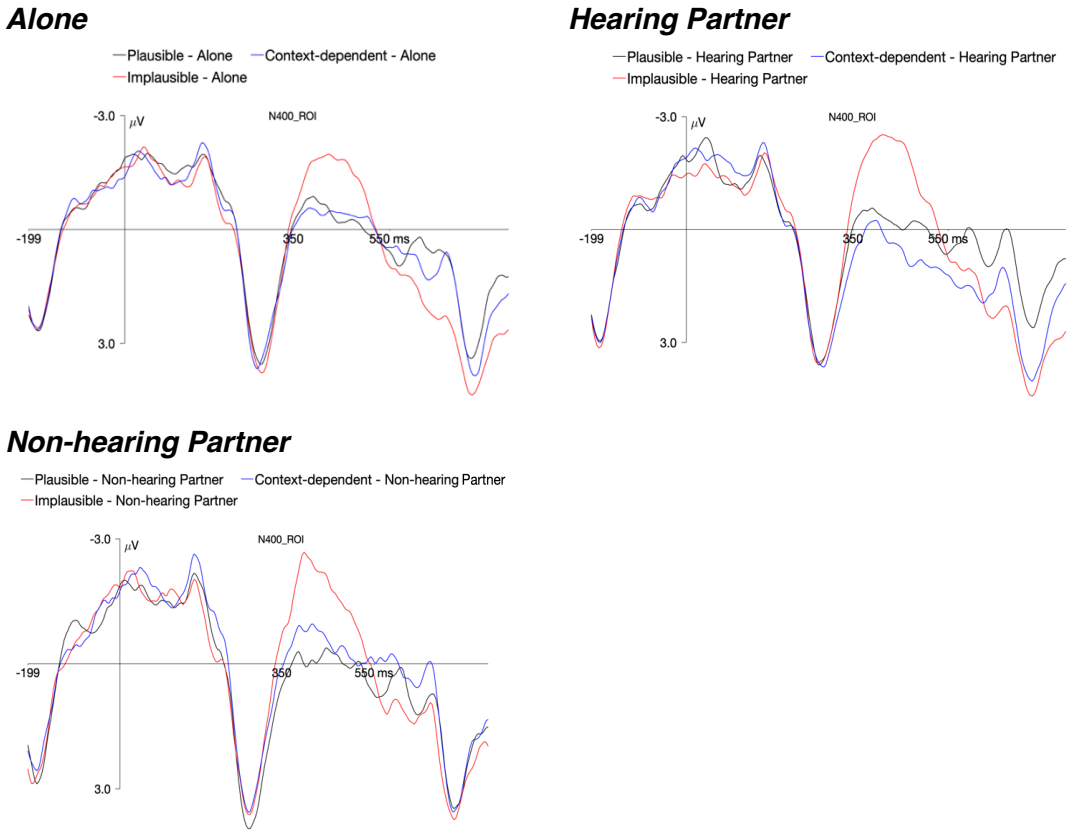

Figure 1. Grand average ERP waveforms by Block and Condition, averaged over the centro-parietal ROI time-locked to the critical word.

References

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