Positive vibes, predictive minds: A positive mood fuels semantic prediction

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Our brains are predictive machines. Growing electrophysiological research has demonstrated that predictive mechanisms are activated when we process language (see León-Cabrera et al., 2024 for a review). Interestingly, recent studies have also shown that mood, our background emotional state, influences language comprehension, with a positive mood facilitating language comprehension compared to a negative mood (see Chwilla, 2022 and Naranowicz, 2022 for reviews). The relationship between mood, language, and prediction has attracted little scholarly attention. To address this research gap, the present event-related potential (ERP) study aimed to explore if and how mood affects predictive mechanisms during semantic processing.

Positive and negative moods were induced in separate blocks using pre-validated 45-second affectively evocative films (N_{Total} = 24 films). Within each mood block, participants viewed 240 sequences of three pictures, each representing distinct concepts, followed by a critical word. Their task was to determine whether the presented word was semantically related to at least one of the three pictures. The critical words were semantically related to the last picture, the last two, or all three, thereby creating low-constraint (LC), medium-constraint (MC), and high-constraint (HC) prediction-building contexts. Additionally, half of the words introduced prediction errors by being semantically unrelated to any of the pictures (N_{Total} = 480 words). We analysed three ERPs: the N400 indexing semantic processing, the stimulus-preceding negativity (SPN) indexing activation of predictive mechanisms, and the late frontal positivity (LFP) indexing prediction re-evaluation.

At the context-building stage, a Mood × Semantic constraint interaction in the N400 time window (300–500 ms after the third picture onset) showed smaller N400 responses in both HC and MC than LC contexts in a positive mood and smaller N400 responses in HC than both MC and LC contexts in a negative mood. This suggests that a positive mood facilitates semantic processing while a negative mood requires stronger contextual support to enable semantic integration. At the prediction-generation stage, a Mood × Semantic constraint interaction in both initial and late SPN time windows (800–400 and 400–0 ms prior to the word onset) showed no SPN modulations in a negative mood and larger SPN responses in HC compared to both MC and LC contexts in a positive mood. This indicates that, in contrast to a negative mood, a positive mood activates predictive thinking when much contextual information is readily available. At the word-level stage, a Mood × Semantic constraint interaction for semantically congruent words in the LFP time window (800–1,000 ms after the word onset) showed no LFP modulations in a negative mood, and larger LFP responses in HC compared to both MC and LC contexts in a positive mood. Such result point to stronger engagement in updating and confirming predictions only in a positive mood, but mainly when the word aligns well with the prior semantic context. Together, these findings indicate that, in contrast to a negative mood, a positive mood triggers predictive mechanisms when sufficient smentic context is provided at different stages of semantic processing.

Word count: 492

References:

Chwilla, D. J. (2022). Context effects in language comprehension: The role of emotional state and attention on semantic and syntactic processing. *Frontiers in Human Neuroscience*, *16*, 1014547. https://doi.org/10.3389/fnhum.2022.1014547

León-Cabrera, P., Hjortdal, A., Berthelsen, S. G., Rodríguez-Fornells, A., & Roll, M. (2024). Neurophysiological signatures of prediction in language: A critical review of anticipatory negativities. *Neuroscience & Biobehavioral Reviews*, 160, 105624. https://doi.org/10.1016/j.neubiorev.2024.105624

Naranowicz, M. (2022). Mood effects on semantic processes: Behavioural and electrophysiological evidence. *Frontiers in Psychology*, *13*, 1014706. https://doi.org/10.3389/fpsyg.2022.1014706

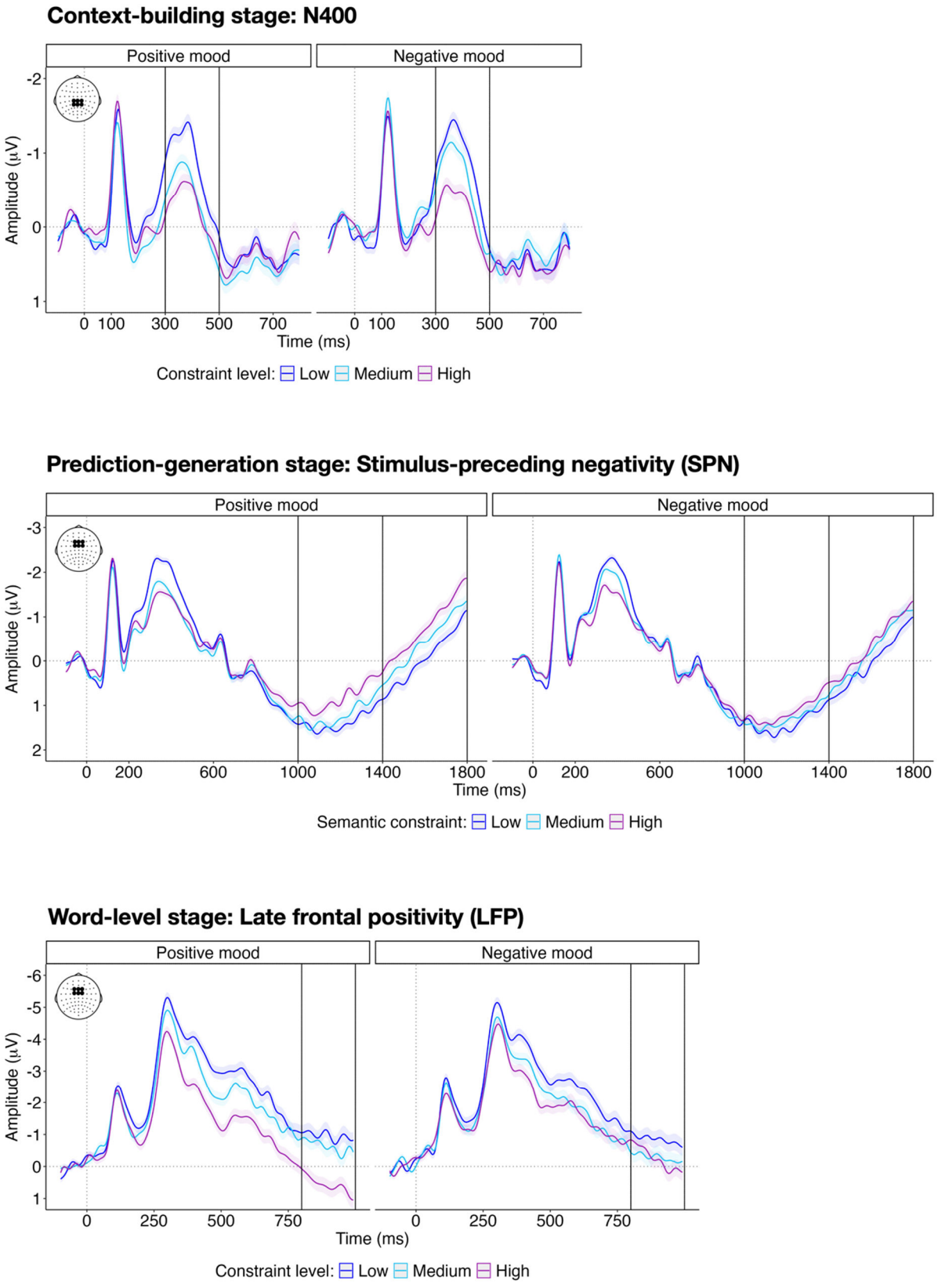

Figure 1. Visual representations of Mood × Semantic constraint interactions at the context-building, prediction-generation, and word-level stages.