Emotion and Time Shape Attentional Engagement: ERP Correlates from a Dot-Probe Task

Saturday, September 13, 2025 12:20 PM (10 minutes)

Introduction: The dot-probe task assesses attentional bias toward emotional stimuli, though dot-locked dynamics, a marker of attentional engagement, remain underexplored. By combining behavioral (reaction times, RTs) and event-related potential (ERP) measures, we examined whether attentional engagement in healthy participants changed over the course of the task as a function of emotional valence.

Methods: Twenty-one female students (22.2±3.0 years) performed a dot-probe task during 64-channel EEG recording, responding to dots following happy/sad faces.

A dot-locked grand-average waveform was computed across valence on midline electrodes to identify P200, N2pc, and P300 components (160-202 ms, 202-230 ms, 230-466 ms) based on surrounding zero-crossings.

To account for lateralization, in right-sided trials EEG signals were swapped, aligning left/right hemisphere to ipsilateral/contralateral responses and averaging separately by dot-replaced image valence.

ERP amplitudes and RTs, averaged by task half, were analyzed via 2×2 ANOVA.

Results: No effects emerged for P200 and N2pc. Conversely, P300 showed a Valence×Time interaction: while responses to dot replacing emotional stimuli were similar in the first half of the task, in the second half P300 amplitude was higher when dot replaced positive stimuli across fronto-central and parieto-occipital regions. No effects were observed for RTs.

Conclusions: Findings reveal a dynamic organization of attentional engagement. Early ERP responses remained stable across valence throughout the task, supporting consistent environmental monitoring. However, over time, evaluative processing increased for stimuli from positive context, suggesting preferential allocation toward positive information. These putative top-down mechanisms may adapt emotional priorities with increasing task experience. ERPs captured subtle cognitive-emotional dynamics undetected behaviorally.

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