

EEG localization and individual variability in response to emotional stimuli

ABSTRACT:

The focus of this research was to determine if the pre-stimulus electroencephalographic (EEG) activity could differentiate between randomly pending pleasant, unpleasant, and emotionally neutral visual stimuli in the absence of sensory cues. Based on prior EEG studies, we hypothesized that pre-stimulus EEG differences would be observed between the conditions despite the lack of priming or cueing. A first group was recruited to test this hypothesis and a second to replicate the findings. A third exploratory analysis was done to test the same hypothesis on the larger sample. Visual stimuli were selected from a standardized set of pictures for studying emotion and attention (International Affective Picture System) consisting of three categories: highly pleasant, highly unpleasant and emotionally neutral. Prior to the presentation of each of the visual stimuli, participants and experimenters were blind to the pending stimulus that was selected truly randomly. 64-channel EEG data of the pre-stimulus period (-1500 to 0 ms) were analyzed with robust methods including general linear modeling (GLM) with IRLS optimization, 1000-iterations bootstrap, and robust corrections for multiple testing (i.e. spatiotemporal cluster correction). A significant brain cluster difference was observed between the pleasant and neutral conditions from -1072 and -1024 ms over occipito-parietal electrodes ($p < 0.05$, corrected for multiple comparisons). However, this effect was not confirmed by the second group examined. A third exploratory analysis on both groups combined showed a similar significant difference (same conditions and areas; $p < 0.05$, corrected for multiple comparisons) but occurring between 148 and 112 ms before stimulus presentation. While caution should be taken regarding the interpretation of these findings, the robust methods employed in this study suggest they merit replication and further study to be better understood.

Keywords

Anticipation, Electroencephalography, EEG, Pre-stimulus, Emotion.

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