EEG brain dynamics during processing of static and dynamic facial emotional expression

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Abstract

Humans recognize facial emotional expressions (FEEs) better when FEEs are presented dynamically than through static images. Wallraven et al. 2008 propose that humans are sensitive to the natural dynamics of FEEs. Moreover, PET/fMRI studies suggest that differentiated brain networks process static and dynamic FEEs. However, in most cases, dynamic FEEs have been created out of static ones, using linear morphing techniques. Together with the low time resolution of PET/fMRI, such studies fail to capture the modulation of the activated brain networks by the subtle (and highly nonlinear) dynamics of FEEs. Our ongoing study investigates EEG responses to static and dynamic FEEs drawn from an ecologically valid database (Kaulard et al. 2008, Kaulard et al. 2009). "Happy" and "angry" FEEs performed by two male and two female actors are displayed to twenty female participants in an "oddball" experimental paradigm. Blocks of either dynamic or static stimuli that differ in their emotional content ("happy" versus "angry" and reverse) are presented in a pseudorandom order. The task consists of pressing a keyboard button upon appearance of a deviant stimulus. Data analysis focuses on synchrony and nonlinear coupling of sensor as well as source dynamics (as a bridge to PET/fMRI studies), both in the time-frequency and in the phase-space domain, to identify the brain networks that emerge and evolve dynamically in each condition. Preliminary results from pilot data analysis confirm the PET/fMRI findings of enhanced and differentiated brain activations for dynamic FEEs compared to static ones.

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