Dual-EEG of joint tapping: what can two interacting brains teach us about social interaction?

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Abstract

The neural mechanisms underlying real-time social interactions remain largely unknown. Only a small number of recent studies have explored what goes on in brains of two people during true social interaction. Here, we asked whether information gained from two truly interacting brains can better reveal the neural signatures of social interaction than separate investigation of two brains. We measured dual-EEG during an interactive finger-tapping task. Pairs of participants were asked to synchronize with an auditory signal coming either from their partner (interactive or 'coupled' condition) or from a computer ('uncoupled' computer-controlled condition). Time-frequency analysis revealed stronger left-motor and right-frontal suppression at 10 Hz during the interactive condition than during the uncoupled computer-driven condition. We used machine-learning approaches to identify the brain signals driving social interaction. We combined data from both participants in each pair (raw-power at 10 Hz during tapping at each electrode), and applied logistic regression using feature selection in order to classify the two tapping conditions. The first seven (frontal) electrodes consistently emerged as good classifiers, with 85-99% accuracy. Moreover, there was a tendency for one member's frontal electrodes to drive the classifier over the other's, which predicted the leader of the interaction in 8/9 pairs. This study shows how analyzing two interacting brains can give better classification of behaviour; and hence that the whole of two brains is indeed better than the sum of its parts, at disentangling neural signatures of interaction.

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