Investigating neural correlates of interparticpant movement synchronization using EEG Hyperscanning

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Walking, clapping, dancing - the entrainment of movements is common in social situations. This phenomenon seems to exceed single-brain mechanisms, since mutual adaptation is one of its core features. Previous research suggests that - among the mirror neuron system and frontal alpha activity - cortical oscillations in the primary motor cortex are crucial for establishing synchronization. Namely, transcranial alternating current stimulation (tACS) at 20 Hz in-phase beta frequency led to better/faster initial synchronization in a tapping task (Novembre 2017). In this study we will investigate neural mechanisms underlying synchronization in a tapping task using EEG hyperscanning. We performed a pilot study in which we measured behavioral and neurophysiological (EEG) responses of participants in a tapping task. Participants sat in front of a monitor next to each other, without visual contact. Through earphones covered with earmuffs they could hear their own and their partners button presses, distinguishable by different tapping sounds. The task was to synchronize their tapping within a period of 9 taps with a target frequency of 2 Hz. In this poster, we will present first behavioral and neurophysiological results of the pilot study. We focused our analysis on measuring behavioral synchronization between participants and its neural underpinnings. Namely, we analyzed event related potentials (ERP) triggered by tapping in both participants. We observed pairs that have clear leader-follower distinction as well as pairs that entrain to each other while tapping. Furthermore, we found ERPs differences between leaders, followers and entrained participants. Suggesting that different brain dynamics are related to different roles in a cooperative task. In sum, we present preliminary results of our ERP and behavioral analysis. Beyond the behavioral and ERP analysis, we will give an outlook on future interbain analyses. They will be applied in order to gain insight into the role interbrain couplings in the time-frequency domain play in tapping synchronization.

Novembre, G., Knoblich, G., Dunne, L., & Keller, P. E. (2017). Interpersonal synchrony enhanced through 20 Hz phase-coupled dual brain stimulation. *Social cognitive and affective neuroscience*, *12*(4), 662-670.