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Neural Mechanisms of Joint Action in Musical Ensembles: Disentangling Self and Other Integration

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Subtheme B - Auditory, Motor and Sensory Integration

Musical ensembles continuously anticipate and adapt to each other's movements for optimal joint performance. Players must divide their attentional resources between their own actions and those of the ensemble. In improvisational contexts, this dynamic interplay becomes even more critical. However, neural mechanisms for joint action remain challenging to study due to the entanglement of movement perception and production in brain activity. Here we disentangle neural responses related to self versus other, and assess their integration by combining dual-EEG recordings with frequency-tagging techniques. Participants wore LEDs flickering at 5.7 and 7.7 Hz on their index finger while producing novel patterns of coordinated horizontal forearm movements by varying the speed and amplitude. We aim to reproduce and extend the findings from Varlet et al. (2020) who demonstrated that: 1) leadership roles influence individual's monitoring of self- and other-generated movements and the degree to which they are integrated, 2) neural activity of self-other integration is strongest during cooperative joint action without an assigned leader, and 3) that coordination strength is related to the amplitude of neural activity at self-other integration frequencies. We will extend their findings, obtained during synchronised (in-phase) movement improvisation, to anti-phase (180-degree relative phase difference) coordination. Anti-phase coordination is expected to require more effort to maintain, being the less stable pattern. As a result, stronger neural self-other integration responses are hypothesised to occur during anti-phase coordination compared to in-phase coordination. The same relationship between coordination strength and self-other integration strength is expected in anti-phase coordination, unless the integration strength in the original study was confounded by the physical proximity of the frequency tagged LEDs. The implications of this study have wide-reaching applications beyond musical contexts, as we coordinate with people in our environment across a wide range of tasks, both for social purposes and to extend our action capabilities.