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Continuity between the real and virtual body during action observation enhances motor cortical excitability

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The sense of body ownership (i.e., the belief that the body belongs to oneself) is fundamental in body perception, involving the integration of different sensory inputs. Virtual Reality (VR) manipulations facilitate the alteration of body ownership. Notably, a decrease in ownership sensations occurs over the virtual body in the presence of a visual discontinuity between the hand and the body of the avatar. Recent research further revealed how bodily illusions can manipulate body ownership, concurrently leading to changes in motor cortex excitability. Here, we hypothesized that the degree of body continuity between one's physical body and the observed virtual body may also impact motor cortex excitability during action observation. Specifically, we investigated whether observing virtual movements from a first-person perspective in different conditions of body continuity affects cortical excitability in the primary motor cortex (M1) using transcranial magnetic stimulation (TMS). Participants immersed in VR environments observed left-hand movements in three conditions that differed in the amount of body continuity between the real and virtual body (Full body; Upper Limb; Hand Detached). Motor Evoked Potentials induced by TMS pulses over the right M1 were recorded during action observation to measure motor cortex excitability. Embodiment sensations were assessed through a questionnaire. Results showed that variation in body continuity affects embodiment sensations, along with increasing corticospinal excitability when virtual body continuity is higher (i.e., in Full-Body and Upper Limb compared to Hand Detached conditions). Embodiment sensations mediated this effect, supporting the crucial relationship between body perception and motor cortical excitability.

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Primary author: Dr FRISCO, Francesca (Milano-Bicocca University)

Co-authors: Dr MATAMALA-GOMEZ, Marta (University of Barcelona); Dr GUIDALI, Giacomo (University of Milano-Bicocca); Prof. LEGA, Carlotta (University of Pavia); Prof. BEACCO, Alejandro (Universitat Politècnica de Catalunya); Prof. BOLOGNINI, Nadia (University of Milano-Bicocca); Prof. MARAVITA, Angelo (University of Milano-Bicocca)

Presenter: Dr FRISCO, Francesca (Milano-Bicocca University)

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