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FEELING TOUCH THROUGH SIGHT: BEHAVIORAL AND NEUROPHYSIOLOGICAL EVIDENCE OF TACTILE PERCEPTION BEYOND THE OWN BODY BOUNDARIES

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Background: Touch is strongly related to the bodily-self, forming the boundary between one's own and others' bodies. Previous studies investigated the relationship between touch and body-ownership (i.e., the feeling that body-parts belong to us) demonstrating that somatosensory experiences arising from the skin are at the root for a coherent sense of body-ownership. Neuropsychological evidence suggests that brain-lesions inducing body-ownership delusions lead patients to feel touches onto another's body, suggesting the potentiality of sensing touches even beyond the own body boundaries.

Aims: Against this background, we focus on the role of body-ownership in gating tactile awareness, asking whether the belief of owning a body part determines the ability to perceive tactile sensations on it.

Method: To this aim, we exploited the Rubber Hand Illusion, inducing a feeling of ownership onto a fake hand, combined with a tactile task. During the experiment, following repeated periods of illusion induction (synchronous and asynchronous), tactile events randomly occurred on either the fake (visual-touch) or the own (real-touch) hand. Through a VAS scale, we collected somatosensory reports related to both visual- and real-touch and, by combining EEG with TMS pulses over S1 contingent upon tactile events, we analyzed the touch-related neural dynamics.

Results: Tactile perception increased at the sight of touches occurring onto the fake (embodied) hand, while it decreased when the own (disembodied) hand was touched. The S1 alpha-band connectivity fully paralleled the diametrical modulation of tactile perception, providing evidence of the neurophysiological blueprint, with an increased alpha-band connectivity at the sight of the fake (embodied) hand being touched and a reduced alpha-band connectivity when the own (disembodied) hand is touch.

Conclusions: Taken together our results demonstrate a body ownership dependent modulation of tactile awareness from both a behavioral and a neurophysiological point of view, unveiling the inner potentiality of our brain to feel touch through sight. This evidence bears potential implications for the development of neuroprosthetic devices and rehabilitative trainings to recover impaired somatosensation.

Keywords: Body ownership, Tactile awareness, TMS-EEG

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