

How body ownership shapes tactile awareness: Inducing phantom sensations and measuring their electrophysiological correlates in immersive virtual reality

ABSTRACT:

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 (the feeling that body-parts belong to us) by addressing how somatosensory experiences contribute to discriminate one's own body from the external world. This line of research corroborates the idea that tactile awareness (the conscious experience of tactile events) contributes to the emergence of the sense of body ownership, so that "I believe this body to be mine because I perceive touch on it".

Aims

Here, we investigated the opposite question: "Do I feel this body perceiving touch because I believe it to be mine?".

Method

To this aim, we capitalized on the rubber hand illusion to alter the sense of body ownership and explore its role in gating tactile awareness. Hence, repeated periods of illusion induction were randomly followed by tactile events delivered either onto the fake (visual-touch) or the own (real-touch) hand.

Results

Leveraging this procedure, we demonstrate a diametrical body ownership-dependent modulation of tactile awareness at both behavioural and neurophysiological levels. Indeed, somatosensory processing (subjective perception and its neurophysiological blueprint) increases when participants observe the fake (embodied) hand while it decreases when participants receive a tactile stimulation on the real (disembodied) hand.

Conclusions

These results reveal that the brain is endowed with the inner potentiality of sensing beyond the boundaries of the own body thus experiencing phantom touches. This evidence bears potential implications for the development of neuroprosthetic devices and rehabilitative training to recover impaired somatosensation.

Keywords

Body ownership, Tactile awareness, Electroencephalography, TMS-EEG

Published Work:

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