

## RAVE-08 Abstract

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### Moving a Virtual Body by Thought

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#### *Abstract*

The internal representation of our own body is an important layer of the consciousness of ourselves. Different body illusions (e.g., rubber hand illusion, Pinocchio illusion) and neurological alterations (e.g. out-of-the-body experiences after lesions in the temporal parietal junction) illustrate the fact that this internal representation of the own body image is contingent to multisensory correlations and their brain processing. For example, providing correct visuo-tactile correlations, a sensation of ownership over an external object (e.g. a rubber hand) can be generated, accompanied by a proprioceptive displacement of the own arm towards the fake hand.

In previous studies, we have demonstrated that coherent somatosensory and visual information of touch over a real and a 3D projected virtual hand respectively leads to the internalisation of the virtual hand as part of the self-body image (Sanchez-Vives and Slater, 5th Forum of European Neuroscience, July 8-12, 2006, Vienna, Austria). We have as well found that not only the perceptual system is deceived by the “virtual hand illusion”, but also the motor system can be recruited (Slater et al., submitted). Indeed, participants often answer positively to questions related to agency over the virtual arm. In this study, we aimed to explore to what extent moving a 3D virtual arm voluntarily through a brain-computer interface (BCI) could induce the sensations of ownership and agency even if no additional correlated stimuli were provided. Eight participants completed once a motor imagery-based BCI task, consisting of the imagination of left hand or feet movement that resulted in closing/opening of the virtual hand, respectively. Questionnaires (modified from: Botvinick and Cohen, Nature 391:756, 1998) revealed a significant feeling of ownership and agency. Proprioceptive displacement of the real arm's position was not significant though, suggesting that it is a weaker illusion than the one induced by correlated stimulation.

The internalisation of virtual bodies is not only critical for the successful exploitation of virtual environments in physical and neural rehabilitation. Existing in the real world is inevitably linked to experiencing our body; therefore, any interaction in the virtual environment, including social interactions, should be enhanced by the correct internalisation of a virtual *alter ego*.

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