

## Inducing ownership of a virtual arm

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Although the internal representation of the self-body image appears to be stable, a number of different body illusions (e.g. rubber hand, Pinocchio) and neurological alterations (e.g. phantom limbs, out-of-the-body experiences) challenge this idea. In our studies we explored the extent to which it is possible to internalize virtual body parts and feel them as part of our body image, as a first step before trying to own a whole virtual body. It has been demonstrated that coherent somatosensory and visual information of touch on a real and a 3D projected virtual hand respectively leads to the illusion of ownership of the virtual hand, becoming part of the own body image (Slater et al., *Frontiers in Human Neuroscience*, 2:6, 2008), thus inducing a 'virtual hand illusion' (VHI). This illusion involved not only a feeling of ownership but also of agency, along with a proprioceptive drift toward the fake limb. We also found that not only the perceptual system is deceived by the VHI, but also the motor system can be recruited (Sanchez-Vives et al., *PLoS One*, 5:e10381, 2010). When the voluntary control of a virtual hand is achieved by means of a brain-computer interface (BCI) a similar illusion of ownership and agency can also be evoked, although no proprioceptive displacement occurred (Perez-Marcos et al., *Neuroreport*, 20:589-594, 2009). This suggests that the generation of motor commands along with a coherent visual feedback is enough to generate an illusion of ownership over a virtual body part, even in absence of additional multisensory correlations. Our results suggest that different combinations of sensory and motor correlations are sufficient to result in a successful identification with a virtual arm as if it were our own. These experiments as well as the implications of these studies will be discussed.