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# Multisensory Mechanisms of Owning an Entire Artificial Body

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## Abstract

When we look down at our body we immediately experience that it belongs to us. We do not experience our body as a set of fragmented parts, but rather as a single entity. How does this perception of owning an entire body arise? Here we address this question by using a 'body-swap' illusion where people experience an artificial body as their own body, in combination with brain imaging and behavioral experiments. Our behavioral and psychophysiological results suggest that the following factors are necessary for the elicitation of the illusion: i) temporal congruency of visual and tactile signals; ii) spatial congruency of visual and tactile signals in an external reference frame centered on the body; iii) a humanoid body shape; (iv) a first person visual perspective. Importantly, we further describe how ownership generalizes from the stimulated body part to the rest of the (unstimulated) body. Our functional magnetic resonance imaging studies revealed a tight coupling between the experience of full-body ownership and neural responses in bilateral ventral premotor and left intraparietal cortices and the left putamen. Importantly, activity in the ventral premotor cortex reflected the construction of ownership of a whole body from the parts as it was present irrespectively of which body part that was stimulated to trigger the illusion, and further, this area displayed multivoxel patterns carrying information about full-body ownership. Taken together these results provide a mechanistic multisensory framework to explain how we come to experience an entire body as our own.

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