

Sensory illusion study provides new insight for body representation brain disorders

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People can be easily tricked into believing an artificial finger is their own, shows a study published today in *The Journal of Physiology*. The results reveal that the brain does not require multiple signals to build a picture body ownership, as this is the first time the illusion has been created using sensory inputs from the muscle alone.

The discovery provides new insight into clinical conditions where body representation in the brain is disrupted due to changes in the central or peripheral nervous systems e.g. stroke, schizophrenia and phantom limb syndrome following amputation.

Professor Simon Gandevia, Deputy Director of Neuroscience Research Australia (NeuRA), says: "It may seem silly to ask yourself whether your index finger is part of your body. However, our current findings demonstrate that this question has led to important insights into key brain functions.

"These findings could lead to new clinical interventions where the addition or the removal of specific [sensory stimuli](#) is used to change someone's body image."

In the experiment, subjects held an artificial finger with their left hand that was located 12 cm above their right index finger. Vision was eliminated and anaesthesia was used to numb the skin and remove feelings of joint movement. When the artificial finger and the right index finger were moved synchronously, subjects reported they were

holding their own index finger: the brain incorrectly incorporated the artificial finger into its internal body representation.

The [human brain](#) uses [sensory signals](#) to maintain and update internal representation of the body, to plan and generate movements and interact with the world. The study gives new understanding as to how the brain decides what is part of our own body and where it is located. Contrary to previous theories which used multiple [sensory inputs](#) including touch and vision, these results demonstrate that messages coming from muscle receptors are enough to change the internal body representation.

The team additionally found a new type of sensory 'grasp illusion' in which perceived distances between index fingers decreases when subjects hold an artificial finger. This implies that the brain generates possible scenarios and tests them against available sensory information.

Professor Gandevia says: "Grasping the artificial finger induces a sensation in some subjects that their hands are level with one another, despite being 12 cm apart. This illusion demonstrates that our brain is a thoughtful (yet at times gullible!) decision maker: it uses available sensory information and memories of past experiences to decide what scenario is most likely (i.e. 'my hands are level')."

More information: Héroux M, Walsh L, Butler A and Gandevia S (2013). Is this my finger? Proprioceptive illusions of body ownership and representation. The *Journal of Physiology*. [DOI: 10.1113/jphysiol.2013.261461](#)

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