

Heart in your hand? Neuroscientists discover a new illusion of consciousness

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The sight of a virtual-reality hand pulsing in time with your heart beat is enough to convince your brain that it's part of your body, according to a new study published this week from the Sackler Centre for Consciousness Science at the University of Sussex.

Neuroscientists and [psychologists](#) have long been fascinated by the 'rubber hand illusion', a clever trick whereby a fake hand is perceived as part of one's body if it is stroked simultaneously with one's real hand. This illusion shows that the brain constructs the experience of 'having a body' and that this experience depends on integration of visual and tactile (touch) [sensory signals](#).

Until now, little has been known about how the experience of 'body ownership' depends on perception of the body's internal processes, like the [heartbeat](#). Yet perception of the body "from within" is thought to be crucial for emotion and consciousness.

A new study by Dr. Keisuke Suzuki, Professor Anil Seth, and colleagues at the Sackler Centre – published in the journal *Neuropsychologia* - now shows that external visualization of one's heartbeat can influence what we experience as our own body.

The team used a unique combination of heartbeat monitoring and augmented reality to implement a 'cardio-visual' version of the rubber hand illusion. Participants wore a [head mounted display](#) through which they saw a virtual-reality version of their own hand projected in front of

them, while their real hand remained hidden out of view. The virtual hand was made to pulse to red and back either in-time or out-of-time with their heartbeat.

The researchers found that the virtual hand was more likely to be experienced as part of a person's body when the 'cardio-visual' feedback was aligned with the actual heartbeat, than when it was misaligned. This shows that the brain integrates its perception of the body from the outside with its perception from the inside, in determining what is experienced as its body.

Professor Seth says; "The findings tie in with our research at the Sackler Centre showing that many other perceptual and cognitive processes can be affected by the beating of the heart in ways that have important implications for clinical conditions such as anxiety and disorders of body image."

The research also supports a new theory of self and emotion being developed by Professors Seth and Hugo Critchley (Sackler Centre directors), according to which the brain is actively and continuously trying to predict its own physiological and physical states.

The use of new technologies to address old questions highlights the innovative approach to consciousness science adopted by Sackler Centre researchers, and future projects will use similar augmented reality methods to further push the boundaries of how we experience ourselves and the world around us.

The paper is titled 'Multisensory integration across exteroceptive and interoceptive domains modulates self-experience in the [rubber-hand illusion](#).'

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