Perceiving touch and your self outside of your body

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When you feel you are being touched, usually someone or something is physically touching you and you perceive that your "self" is located in the same place as your body. In new research published in the open-access, peer-reviewed journal *PLoS ONE*, neuroscientists at the Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, investigated the relationship between bodily self-consciousness and the way touch stimuli are spatially represented in humans. They found that sensations of touch can be felt and mislocalised towards where a "virtual" body is seen. These findings will provide new avenues for the animation of virtual worlds and machines.

In their previous research, Professor Olaf Blanke's lab at the EPFL found that the consciousness of one's own body (the sense of self-identification and self-location) can be altered in healthy people under certain experimental conditions, yielding similar sensations to those felt in out-of-body experiences. In this new study, Aspell and colleagues in Blanke's lab used a crossmodal congruency task to determine whether there is a change in touch perception during this illusion.

A number of earlier studies showed that if a rubber hand is positioned such that it extends from a person's arm while her actual hand is hidden from view, and both her real hand and the rubber hand are stroked at the same time, she seems to feel the touch in the location where she sees the rubber hand being touched. This effect and the experienced 'ownership' of the rubber hand is the "rubber hand illusion."

Aspell, a postdoctoral researcher, along with graduate student Bigna Lenggenhager and Professor Olaf Blanke sought to expand on this research to see whether there are changes in touch perception when humans experience ownership of a whole virtual body. They designed a novel behavioural task in which the experimental participants had to try to detect where on their body vibrations were occurring. At the same time, they viewed their own body via a head-mounted display connected to a camera filming the participant's back from two metres away. The participants had to ignore light flashes that appeared on their body near the vibrators. To induce the feeling that they were located in the position where they viewed their body (i.e. two metres in front of them), participants were stroked on their backs with a stick. This induced a "full body illusion" in which a person perceives herself as being located outside the confines of her own body.

By measuring how strongly the light flashes interfered with the perception of the vibrations, the researchers were able to show that the mapping of touch sensations was altered during the full body illusion. The mapping of touch in space was shifted towards the virtual body when subjects felt themselves to be located where the virtual body was seen.

This study demonstrates that changes in self-consciousness ('where am I located?' and 'what is my body?') are accompanied by changes in where touch sensations are experienced in space. Importantly, these data reveal that brain mechanisms of multisensory processing are crucial for the "I" of conscious experience and can be scientifically manipulated in order to animate and incarnate virtual humans, robots, and machines.

More information: Aspell JE, Lenggenhager B, Blanke O (2009) Keeping in Touch with One's Self: Multisensory Mechanisms of Self-Consciousness. PLoS ONE 4(8): e6488. doi: 10.1371/journal.pone.0006488