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Scientists propose explanation for out-of-body experiences

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Using virtual reality goggles to mix up the sensory signals reaching the brain, scientists have induced out-of-body-like experiences in healthy people, suggesting a scientific explanation for a phenomenon often thought to be a figment of the imagination.

The sight of their bodies located somewhere else -- thanks to the goggles -- plus the feel of their real bodies being touched simultaneously made volunteers sense that they had moved outside of their physical bodies, according to a pair of studies in the 24 August 2007 issue of the journal *Science*.

A disconnect between the brain circuits that process both these types of sensory information may thus be responsible for some out-of-body experiences, the researchers say.

Out-of-body experiences, which generally involve the feeling of disembodiment and seeing one's own body from a location outside the body, can occur in part through drug use, epileptic seizures and other types of brain disturbances.

By projecting a person's awareness into a virtual body, the techniques used in these studies may be useful for training people to do delicate "teleoperating" tasks, such as performing surgeries remotely. The findings may also remove some of the stigma that patients with neurological disorders may feel about having these experiences, which are frequently attributed to an active imagination or some sort of

paranormal phenomenon.

The studies also help solve the age-old question of how we perceive our own bodies.

“I’m interested in why we feel that our selves are inside our bodies -- why we have an ‘in-body experience,’ if you like. This has been discussed for centuries in philosophy, but it’s hard to tackle experimentally,” said Science Brevium author Henrik Ehrsson of University College London, in London, and the Karolinska Institute in Stockholm.

Both Ehrsson and another research team, led by Olaf Blanke of the Ecole Polytechique Fédérale de Lausanne (EPFL) and the University Hospital in Geneva, Switzerland, used video cameras and virtual reality goggles to show volunteers images of their own bodies from the perspective of someone behind them. The researchers also touched the volunteers’ bodies, both physically and virtually.

The volunteers in Ehrsson’s study viewed images recorded by the cameras through their headsets. In Blanke and colleagues’ study, the video was converted into holograph-like computer simulations.

Ehrsson had the volunteers watch a plastic rod moving toward a location just below the cameras while their real chests were simultaneously touched in the corresponding spot. Questionnaire responses afterwards indicated that the volunteers felt they were located back where the cameras were placed, watching a dummy or a body that belonged to someone else.

“This experiment suggests that the first-person visual perspective is critically important for the in-body experience. In other words, we feel that our self is located where the eyes are,” Ehrsson said.

Ehrsson also had the volunteers watch a hammer swing down to a point below the camera, as though it were going to "hurt" an unseen portion of the virtual body. Measurements of skin conductance, which reflects emotional responses such as fear, indicated that the volunteers sensed their "selves" had left their physical bodies and moved to the virtual bodies.

Blanke's team used a similar setup to create out-of-body-like experiences (which they cautioned lacked some aspects of full-blown out-of-body experiences).

After the virtual reality exercise, a researcher would blindfold the volunteers and guide them backward. When the volunteers were asked to return to their original position, they tended to drift toward where they had seen their virtual bodies standing.

Both studies conclude that "multisensory conflict" is a key mechanism underlying out-of-body experiences.

"Brain dysfunctions that interfere with interpreting sensory signals may be responsible for some clinical cases of out-of-body experiences," Ehrsson said. "Though, whether all out-of-body experiences arise from the same causes is still an open question."

Bodily self-consciousness may also involve a cognitive dimension – the ability to distinguish between one's own body and other objects – in addition to sensory signals, Blanke and his coauthors propose.

Supporting this idea, Blanke's team reports that when the volunteers viewed a human-sized block instead of an image of a human body, they successfully returned to their original standing place, indicating that no out-of-body-like illusion had occurred.

“Full-body consciousness seems to require not just the ‘bottom up’ process of correlating sensory information but also the ‘top down’ knowledge about human bodies,” Blanke said.

Some of the out-of-body experiences that have previously eluded scientific explanation may be related to distorted “full-body perception,” according to Blanke. Virtual reality systems may provide further answers.

“We have decades of intense research on visual perception, but not very much yet on body perception. But that may change, now virtual reality offers a way to manipulate full body perception more systematically and probe out-of-body experiences and bodily self consciousness in a new way,” Blanke said.

Source: American Association for the Advancement of Science