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From the Los Angeles Times

## Out-of-body experience created in labs

Two separate studies explore consciousness using virtual-reality goggles to create sensory illusions.

By Denise Gellene

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Exploring the connection between our mental and physical perceptions of ourselves, scientists on Thursday said they used virtual-reality goggles to induce out-of-body sensations in healthy volunteers.

In simple experiments carried out by teams in Switzerland and England, test subjects looking at video images of themselves projected through the goggles reacted as if their own bodies had been touched when their virtual selves were stroked or poked.

Tricked by the illusion, participants reported feeling that their consciousness had drifted from their real bodies into their virtual ones.

The research helps explain the odd sense of floating outside the body, which people sometimes experience after such traumatic events as car accidents. Out-of-body experiences have also been reported in cases in which a critical area of the brain is damaged, such as from stroke, epilepsy or cancer.

The studies, published in the journal *Science*, "call into question the axiom that every thing you are is anchored in your body," said Vilayanur S. Ramachandran, director of UC San Diego's Center for Brain and Cognition, who was not involved in the current research.

Instead, Ramachandran said, "what you regard as you is really a transient construct created by the brain from multiple sensory sources."

When visual, tactile or other inputs don't line up, he said, the boundaries of self-perception shift.

In England, Dr. H. Henrik Ehrsson of University College London, asked 12 volunteers to wear virtual-reality goggles while they sat in an empty room. A camera behind each participant projected an image of their backs. Thus, the participants viewed their own backs from the perspective of someone sitting behind them.

Ehrsson stroked each participant's chest with a stick, carefully keeping his arm and the stick out of the camera's view. At the same time, he moved his other arm in front of the camera then dropped it down as if moving to rub the subject's virtual chest.

The subjects could see nothing happening to the images of themselves projected in the goggles. Yet, they could feel the stick on their own bodies. The result was a disorienting mismatch between the subject's tactile and visual senses.

When touched, participants reported they had the experience of drifting outside their own bodies toward the direction of the camera and viewing themselves from behind.

To test the illusion further, Ehrsson wielded a hammer, swinging it in front of the camera.

Even though the participants felt nothing, they flinched and registered fear through sensors attached to their skin.

In the Swiss experiment, Dr. Olaf Blanke of Ecole Polytechnique Federale de Lausanne asked seven subjects to wear virtual-reality goggles while standing in an empty room. A camera behind each person projected three-dimensional images in front of them. Thus, participants felt as if they were standing behind themselves.

When their backs were stroked in sync with the virtual image, participants reported feeling that their consciousness had been transported to the virtual body in front of them.

The experiment was repeated with a virtual image of a human dummy and a large rectangular object. Participants' sense of self floated into the dummy, but not into the object.

Blanke and colleagues said future experiments would look at the effect of disturbing a broader range of sensory perceptions, such as a sense of body position and balance.

The studies "allow us to understand how consciousness works," said Susana Martinez-Conde, a scientist at the Barrow Neurological Institute in Phoenix, who had no connection to the latest research. "It is what makes us who we are, what makes us human."

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