Illusion allows people to 'feel' a force field around their body

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Credit: AI-generated image (disclaimer)

Neuroscientists based in Stockholm, Sweden, have found that they can make people 'feel' the space immediately around them, with participants describing the sensation as if they have a 'force field' surrounding them.

Imagine you've just finished lunch with a friend in a restaurant. As

you're getting up to leave, a waitress passes through your peripheral vision. You'll instinctively move in such a way as not to collide with her—your sense of peripheral space has saved you from getting doused in scalding hot coffee. Imagine if you're walking through a forest and a low-hanging branch suddenly appears in your peripheral vision. Once again, your sense of peripheral space has prevented you from hitting your head on the branch. In essence, our sense of peripheral space acts as an invisible bubble around us that allows us to identify objects within our reach and protects us.

Now researchers have discovered a means to make individuals 'feel' their peripheral space. Published in the journal *Cognition* on 24 June 2016, neuroscientists at the Karolinska Institute in Stockholm have described how they did this, using an altered version of the so-called 'rubber hand illusion.'

In the standard form of this illusion, the experimenter uses a paintbrush to stroke a volunteer's hand (which is hidden from view) and an adjacent, visible rubber hand. The stroking is done simultaneously at the same speed and on the same place on both the real and rubber hand. Within minutes, most people report feeling the touch of the brushstrokes on the rubber hand as if it were a part of their own body. Previously, researchers have noticed that the illusion did not work if the rubber hand was too far away from the real hand, indicating the importance of physical distance.

In the new study, that involved 101 adults, the researchers made one important change to the experiment – they never brushed the rubber hand directly. Instead, they moved the brush above the rubber hand, again though at the same time that the brushstrokes that touched the participant's real hand. In effect, this meant that the participant felt the touch on their real hand but watched the brush move in mid-air, around 10 centimetres above the rubber hand.

For the most part, volunteers reported feeling a 'magnetic force' or a 'force field' between the paintbrush and the rubber hand. They described it as the brush 'hitting an invisible barrier'. They also reported feeling that the rubber hand belonged to them. Here too, distance seems to have been a factor. When the brush was held more than 30 or 40 centimetres above the rubber hand, the illusion disappeared. Placing an opaque metal barrier between the rubber hand and the brush also had this effect.

Arvid Guterstam, one of the study's co-authors speculates that this happens because the barrier makes it impossible for the hand to reach up and grasp anything, or for anything to hit the hand; in essence, it limits the perceived peripersonal space of the limb.

The Swedish team's findings plug into research going back to the 1990s that has suggested that the brain has a mechanism to recognise the immediate space around the body. Michael Graziano, of Princeton University, and his colleagues had recorded the electrical activity of neurons in the parietal and frontal lobes of the brains of monkeys, finding that some neurons fired not only when an object touched a part of the body but also when the object came near it. When the researchers directly stimulated such neurons, they found that the monkeys would reflexively move their heads and limbs as if defending themselves, such as putting their arms in a protective posture.

Although no one has repeated the experiment in humans, there is evidence that certain regions of the brain specifically deal with peripheral space. For example, some people who suffer strokes in the right posterior parietal lobe cannot sense peripersonal stimuli on the left side of their bodies, but can sense things that are further away, outside the peripheral space on that side.

Indeed, there is reason to believe that our fluid 'force field' is also extendable. One example given by Graziano is how a driver has a sense

of their car's boundaries so they don't hit other objects. Or wearing a tall hat for several hours and then seeing how it feels.

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