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Brain rapidly rewires to help us use tools

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Plastic brain A new Japanese study has shown how quickly and effectively the brain can train itself to treat objects like tools as an extension of our hand.

The findings come from research by Dr Eiichi Naito, of the National Institute of Information and Communications Technology in Kyoto, and colleagues, reported today in the journal *Proceedings of the Royal Society B*

(<http://dx.doi.org/10.1098/rspb.2012.0750> [10.1098/rspb.2012.0750](http://dx.doi.org/10.1098/rspb.2012.0750)) .

"Once the brain learns how to use an object it becomes [like] a part of our body - an extension of our own hand," says Naito.

"This study shows that it only takes a relatively short period of time for the brain to rewire itself to do this."

The hand is represented in the motor areas of the brain and when we learn how to use an external object - such as a hammer or cup - it also becomes represented in the brain.

Naito and colleagues previously found that it is the parietal association area that generates a representation of the object, and this area of the brain works together with the motor areas to control the object.

In their latest study the researchers examined this phenomenon further.

Training the brain

Naito and colleagues looked at what happened when 13 people were trained to be able to change the size of a disc on a screen by their hand movements.

The disc expanded when the wrist was flexed to the left and shrank when it was extended to the right.

After a period of training, the researchers then tested to see if they could find evidence that the brain had actually been rewired to treat the disc an extension of the hand.

For this part of the experiment Naito and colleagues relied on the fact that when tendons of the wrist are vibrated, this gives one the illusion that the hand is moving, even though it is not.

First the researchers stimulated the wrists of the participants to give them the illusion that their hand was flexing to the left.

Then they showed them a static image of the disc while still stimulating the illusion of movement.

This sensation of movement decreased once they were shown the static disc and it decreased most in those participants who had learned they could control the movement of the disc with their hand.



Once the brain learns how to use an object it becomes like a part of our body (iStockphoto: Daniel Naylor)

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This provided clear evidence that after just 30 minutes of training, a person's brain can develop new wiring that allows them to control objects as extensions of their hand, says Naito.

"The most notable finding here is how much visual image affects your sensation of movement once the visual information is linked with our hand," he says.

Naito says the findings could be useful in rehabilitation.

It is already known the brain generates motor representations by merely viewing video of bodily movements, he says.

These findings suggest that videos might also be important in helping the brain to relearn how to control objects.

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