NATURE | NEWS

Rewired nerves control robotic leg

Video shows man walking and kicking a football with direct signals from brain.

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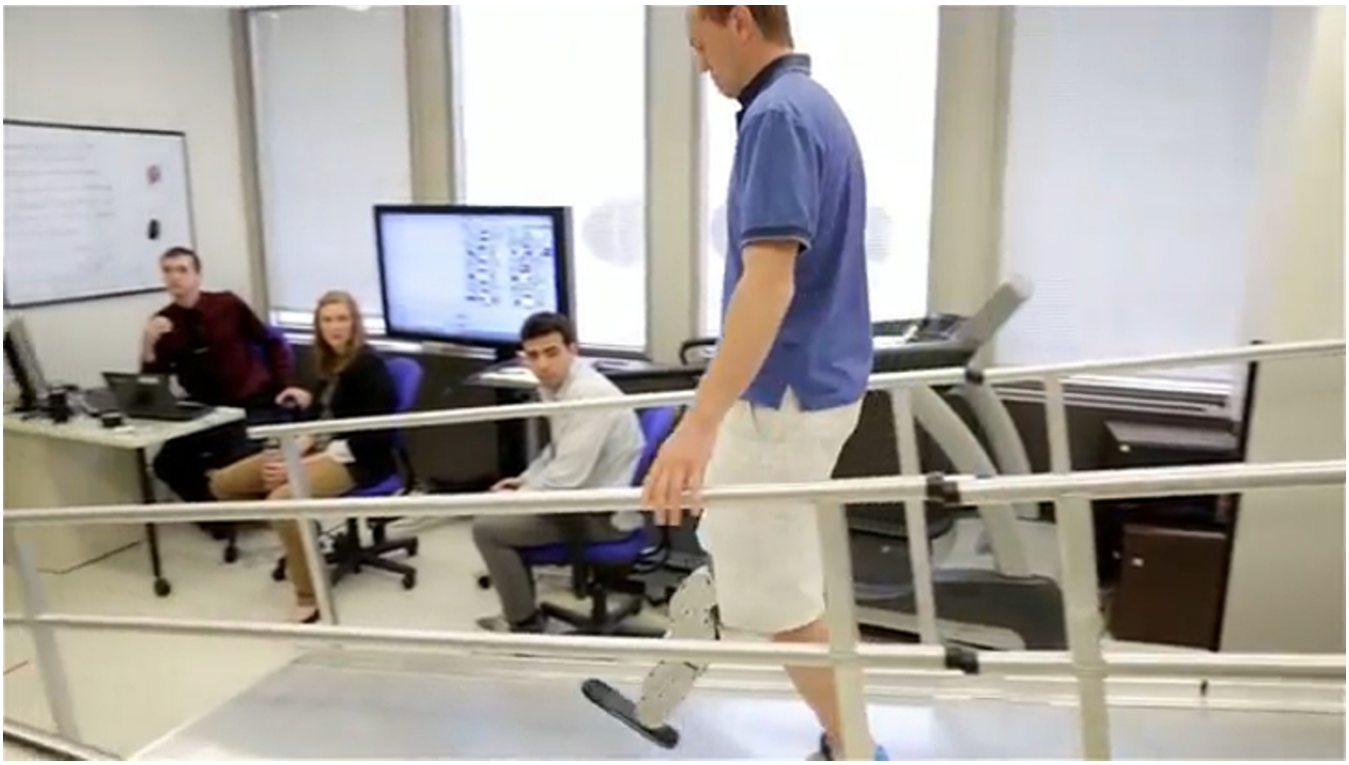


The power of thought alone is not enough to move inanimate objects — unless the object is a robotic leg wired to your brain, that is.

A 32-year-old man whose knee and lower leg were amputated in 2009 after a motorcycle accident is apparently the first person with a missing lower limb to control a robotic leg with his mind. A team led by biomedical engineer Levi Hargrove at the Rehabilitation Institute of Chicago in Illinois reported the breakthrough last week in the *New England Journal of Medicine*[1], including a video that shows the man using the bionic leg to walk up stairs and down a ramp, and to kick a football.

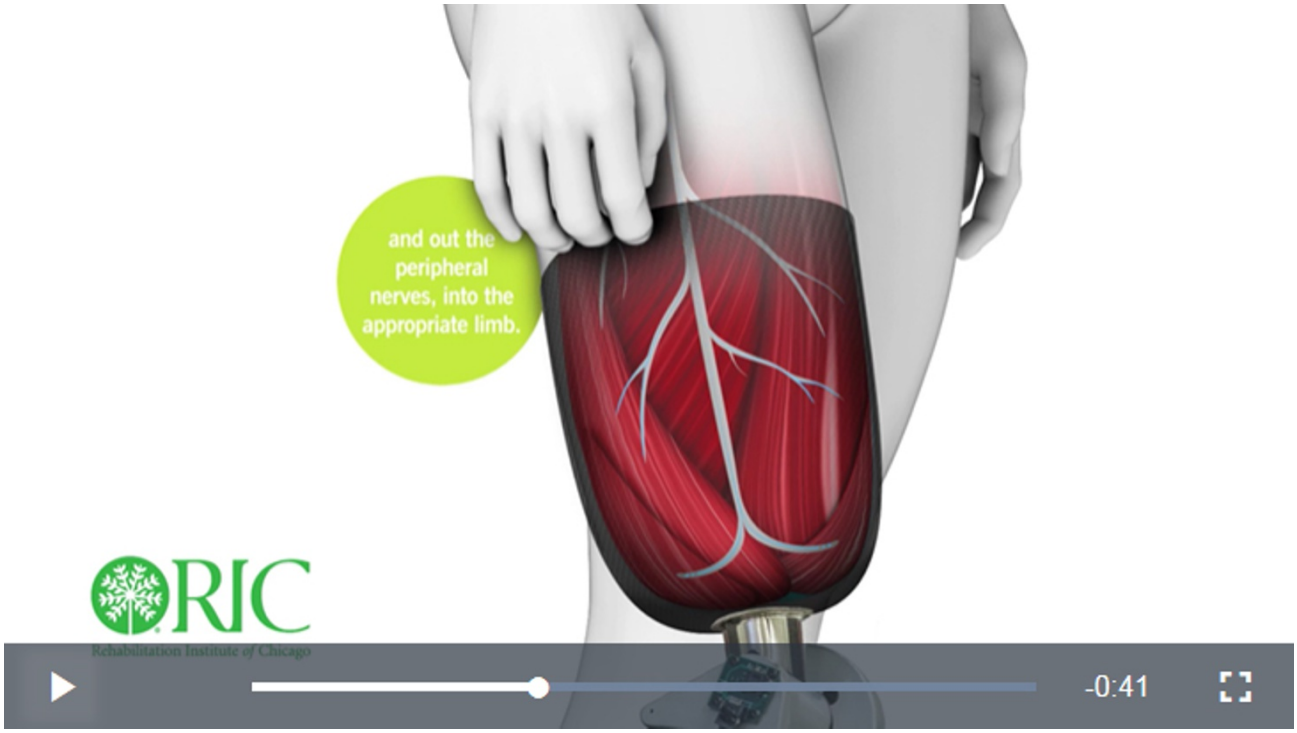
The major advance is that the man does not have to use a remote-control switch or exaggerated muscle movements to tell the robotic leg to switch between types of movements, and he does not have to reposition the leg with his hands when seated, Hargrove says.

“To our knowledge, this is the first time that neural signals have been used to control both a motorized knee and ankle prosthesis,” he says.

Scientists had previously shown that paralysed people could move robotic arms using their thoughts and that able-bodied people can walk using robotic legs controlled by their brains (see, for example, go.nature.com/dgtykw). The latest work goes a step further by using muscle signals to amplify messages sent by the brain when the person intends to move.

To accomplish this, surgeons redirected the nerves that previously controlled some of the man's lower-leg muscles so that they would cause muscles in his thigh to contract in a technique called targeted muscle reinnervation.

They then used sensors embedded in the robotic leg to measure the electrical pulses created by both the reinnervated muscle contractions and the existing thigh muscles. When the surgeons combined this information with additional data from the sensors, the man was able to use the leg more accurately than when attempting to control the leg with its sensors alone, the scientists report. They hope that other people with missing limbs will be able to use the technology within the next three to five years.



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References

1. Hargrove, L. J. *et al*. *New Eng. J. Med.* http://dx.doi.org/10.1056/NEJMoa1300126 (2013).