A helping hand for prosthetics

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An EU-funded project has developed an artificial hand that will revolutionise the lives of amputees. The so-called Smarthand has all the basic functions of its real counterpart including sensitivity and motor control.

For amputees who have lost a hand, the after effects can be devastating. Apart from the obvious loss of a very complex moving part of the body, self-consciousness and distorted self-image as well as excruciating phantom pains can make many aspects of life very difficult.

With all these considerations in mind, 'The smart bio-adaptive hand prosthesis' (Smarthand) project aimed to develop a functional artificial hand with a neural interface that can record data and stimulate nerves accordingly. Evidence suggests that electric stimulation of nerves

associated with phantom pains has positive and pain-killing effects.

The Smarthand that the team developed uses a unique technology that sets it apart from predecessor artificial hands – a measure of sensation for the user. Forty sensors connected to the amputee's remaining upper arm nerves are activated when the user presses the hand on an object. The result is the brain processes these as if they originate in the prosthesis.

Six non-amputees and five amputees were involved in assessing sense substitution to compensate for sensory loss and motor control. Subjects also tested body ownership of the artificial hand. Another trial investigated cortical integration of the hand linked with activation of the somatosensory cortex.

Control of grasping was studied with healthy individuals. Utilising visual input from a camera and a laser pointer, the type of grasp needed was evaluated. Muscle signals control timing of opening and closing of the hand. The final version of the hand after integration of all prosthesis systems was tested with very positive results.

Feedback from trial participants was very encouraging. One man who had previously been fitted with an electronic hook on the loss of his right hand at the wrist commented he was now able to use muscles previously unstimulated with the hook. Moreover, when he held something hard, there was sensation at the fingertips.

The Smarthand prosthesis promises to make a world of difference to the quality of life for amputees. The artificial hand has all the basic features of a real hand. Moreover, amputees may no longer have to face the prospect of taking heavy-duty painkillers for phantom pains.

Provided by CORDIS