Studies promising for sensory feedback for hand prostheses

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(HealthDay)—By triggering sensory stimulation, transradial amputees are able to regain proprioception; and a slippage simulation strategy can detect slipping in a patient with hand amputation, according to two small studies published online Feb. 20 in *Science Robotics*.

Edoardo D'Anna, from the École Polytechnique Fédérale de Lausanne in Switzerland, and colleagues implemented a hybrid approach for restoring multimodal sensory information to two transradial amputees, in which finger position information was provided using sensory substitution based on intraneural stimulation and tactile information was restored using a somatotopic approach. The researchers found that the amputees were able to regain high and close-to-natural remapped proprioceptive acuity. The median joint angle reproduction was 9.1 degrees, while the median threshold to detection of passive movements was 9.5 degrees; these results were comparable to those of healthy participants. Both amputees could discriminate the size and compliance of four objects with high levels of performance (75.5 percent).

Loredana Zollo, Ph.D., from the Campus Bio-Medico University Hospital of Rome, and colleagues implanted a combination of cuff and intraneural electrodes for 11 weeks in a young woman with hand amputation. The implant provided close-to-natural force and slippage sensations. Over time, there was evidence of improvement in the participant's grasping and manipulation capabilities resulting from neural feedback. Fine grasp and manipulation tasks with increasing complexity were successfully fulfilled by the elicited tactile sensations.

"With the obvious caution that our findings come from the analysis of a single case, the above data strongly support that the increased efficacy of afferent information is the main factor responsible for favoring motor learning during the training," Zollo and colleagues write.

Several authors from the D'Anna study disclosed financial ties to startup companies dealing with artificial limbs and robotic hands. Several authors from the Zollo study are inventors on a patent entitled, "Method for automatic detection of phenomena of mutual sliding between two surfaces."

More information: Abstract/Full Text - D'Anna
Abstract/Full Text - Zollo

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