Getting a grip on grasping

Scientists from Freiburg decipher brain commands for different grasp types

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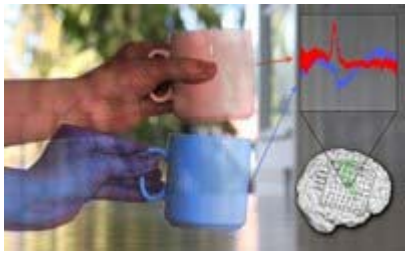

In the brain region responsible for movement (green), the precise grasp (blue mug and curve) is associated with a signal that is distinctly different from the signal of a whole-hand grasp (red; image: BCF/Uni Freiburg).

Quickly grabbing a cup of coffee is an everyday action for most of us. For people with severe paralysis however, this task is unfeasible – yet not “unthinkable”. Because of this, interfaces between the brain and a computer can in principle detect these “thoughts” and transform them into steering commands. Scientists from Freiburg now have found a way to distinguish between different types of grasping on the basis of the accompanying brain activity.
In the current issue of the journal “NeuroImage”, **Tobias Pistohl** and colleagues from the Bernstein Center Freiburg and the University Medical Centre describe how they succeeded in differentiating the brain activity associated with a precise grip and a grip of the whole hand. Ultimately, the scientists aim to develop a neuroprosthesis: a device that receives commands directly from the

brain, and which can be used by paralysed people to control the arm of a robot – or even their own limbs.
One big problem about arm movements had been so far unresolved. In our daily lives, it is important to handle different objects in different ways, for example a feather and a brick. The researchers from Freiburg now found aspects in the brain's activity that distinguish a precise grip from one with the whole hand.
To this end, Pistohl and his collaborators made use of signals that are measured on the surface of the brain. The big advantage of this approach is that no electrodes have to be implanted directly into this delicate organ. At the same time, the obtained signals are much more precise than those that can be measured on the skull's surface.
The scientists conducted a simple experiment with patients that were not paralysed, but had electrodes implanted into their skull for medical reasons. The task was to grab a cup, either with a precise grip formed by the thumb and the index finger, or with their whole hand. At the same time, a computer recorded the electrical changes at the electrodes. And in fact, the scientists were able to find signals in the brain's activity that differed, depending on the type of grasp. A computer was able to attribute these signals to the different hand positions with great reliability. Now, the next challenge will be to identify these kinds of signals in paralysed patients as well – with the aim of eventually putting a more independent life back within their reach.

Pistohl, T., Schulze-Bonhage, A., Aertsen, A., Mehring, C. and Ball, T. (2011) Decoding natural grasp types from human ECoG, NeuroImage, doi:10.1016/j.neuroimage.2011.06.084

Contact:
Dr. med. Tonio Ball
Bernstein Center Freiburg /
Epilepsy Center, University Medical Center Freiburg
ph.: +49 761 270-9316
fax: +49 761 270-9331
e-mail: tonio.ball@uniklinik-freiburg.de