Press Release:

Should we rather call it ‘brake cortex’?

For animals, choosing the right movement at the right time is often a matter of life and death. Accordingly, a large part of the mammalian brain is devoted to the control of movement: The motor cortex**.**

Many previous studies have investigated how neuronal activity in motor cortex might be involved in *causing* movements. In a new study, published on 31.10.2016, scientists from the Humboldt-Universität zu Berlin report that – surprisingly – neuronal activity in motor cortex is *suppressing* movement, rather than causing it.

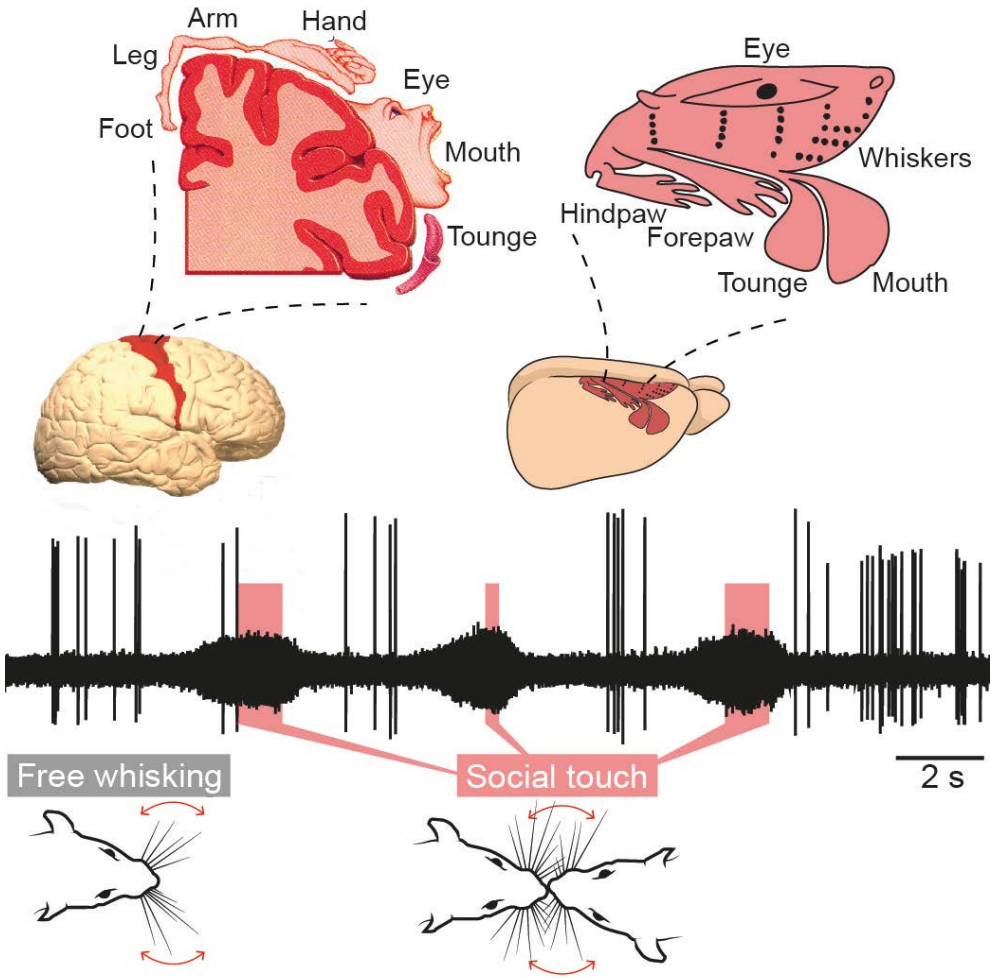
We have long known that motor cortex is arranged like a remarkable ‘map’ of the body (see figure). We also know that important body parts, like the human hand, have a large representation in motor cortex. For different animals, different body parts are important. For example, rats live in dark tunnels and are night-active, so they must sense the world around them by moving their whiskers. Thus, the whisker-region of rat motor cortex is very large.

The group of Berlin scientists observed that during various forms of whisker touch (e.g. whisking during social interactions, or whisking to investigate an object), neurons in whisker motor cortex reduced their activity. This made the scientists wonder if perhaps, when rats do not want to whisk, activity in motor cortex neurons is blocking whisker movements. And perhaps, activity in motor cortex has to decrease in order for rats to start whisking.

To test if this might be the case, the scientists performed two additional experiments, where they manipulated the activity in motor cortex: Artificially increasing motor cortex activity lead to whisker retraction, as if to abort whisker touch. Similarly, artificially reducing motor cortex activity increased whisker movements and brought the whisker forward, as if to engage in whisker touch.

Professor Michael Brecht, who led the study, says: “This brain region is named motor cortex because it was thought to be a kind of *motor*, which generates movement. For us, it was therefore incredibly surprising to see the animals generate more movements, when we blocked motor cortex. Our results show, that – at least sometimes – motor cortex is actually more like a *brake*.”

The discovery of a movement suppressive role of motor cortex might be very important when designing therapies for patients with neurological damage to the motor cortex, for example from a stroke. Such patients often suffer from painful cramps and other symptoms which indicate an abnormally high muscle activity and lack of control over movements.



Above: Both the human brain and the rat brain contains a ‘map of the body’ in **motor cortex** (marked in red). Important movements, like rat whisker movements, have a large representation in motor cortex.

Below: Activity of a single neuron (vertical lines) in **whisker motor cortex** is strongly suppressed during various forms of whisking behavior, in this case, during a **social interaction** with another rat.

Original publication:

Ebbesen, C.L., Doron, G., Lenschow, C. & Brecht, M. (2016) Vibrissa motor cortex activity suppresses contralateral whisking behavior. *Nature Neuroscience* doi:10.1038/nn.4437

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