

Electrical brain stimulation may evoke a person's 'will to persevere'

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What gives some people the ability to persevere through difficult situations that others may find insurmountable? The answer is no doubt a complicated one that may be beyond our full understanding, but new research publishing online December 5 in the Cell Press journal *Neuron* provides some intriguing insights. The study pinpoints a region of the brain that, when stimulated, causes an individual to anticipate a challenge and possess a strong motivation to overcome it.

"That few electrical pulses delivered to a population of brain cells in conscious human individuals give rise to such a high level set of emotions and thoughts we associate with a human virtue such as perseverance tells us that our unique human qualities are anchored dearly in the operation of our [brain cells](#)," says lead author Dr. Josef Parvizi, of the Department of Neurology and Neurological Sciences at Stanford University.

The study conducted by Dr. Parvizi and his team involved two individuals with epilepsy who had electrodes implanted in their brains to help doctors learn about the source of their seizures. The electrodes were situated in the anterior midcingulate cortex, a brain region that is thought to be involved in emotions, pain, and decision making.

When electrical charge was delivered to a location within this region, both patients described feeling the expectation of an imminent challenge coupled with a determined attitude to surmount it. This was accompanied by increased heart rate and physical sensations in the chest

and neck. They did not experience any of these psychological or physical effects when they thought that their brains were being stimulated but no [electrical charge](#) was delivered. The same effects did not occur with stimulation of nearby regions only 5 mm away.

Imaging experiments conducted in Dr. Michael Greicius' laboratory at Stanford revealed that the site of stimulation in both patients was at the core of a network linking the anterior midcingulate cortex to other regions of the brain. "Our study pinpoints the precise anatomical coordinates of neuronal populations, and their associated network, that support complex psychological and behavioral states associated with perseverance," explains Dr. Parvizi.

The findings suggest that differences in the structure and function of this network may be linked with innate differences in our abilities to cope during tough situations. The results may even pertain to psychopathological conditions in which people experience a significantly reduced capacity to endure psychological or physical distress.

"These innate differences might potentially be identified in childhood and be modified by behavioral therapy, medication, or, as suggested here, [electrical stimulation](#)," says Dr. Parvizi.

More information: *Neuron*, Parvizi et al.: "The Will to Persevere Induced by Electrical Stimulation of the Human Anterior Cingulate Cortex." [dx.doi.org/10.1016/j.neuron.2013.10.057](https://doi.org/10.1016/j.neuron.2013.10.057)

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