

Compensation by healthy brain parts found to alleviate some Parkinson's symptoms

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In Parkinson's disease, the cerebral cortex can take over tasks from a deeper part of the brain that has been damaged, where cells that make dopamine have been lost. The strength of compensation by the cerebral

cortex determines how many symptoms people have. This is shown in a publication by Radboud university medical center. Patients can stimulate this compensation through sports, for example, and thus slow down the disease process.

It was already known that in Parkinson's disease the cells in the brain that produce dopamine slowly disappear. This is why patients are given extra dopamine as medication. But only a limited link has been found between the loss of those cells, and the severity of symptoms in Parkinson's. Even if all the cells have disappeared, one person experiences mild symptoms, while another has many more symptoms. Researchers at the Radboudumc looked into whether something else might be going on.

They discovered that the outer layer of the brain, the cerebral cortex, can compensate for the loss of the cells that make dopamine, thereby delaying the worsening of symptoms. It turns out that the severity of symptoms is clearly related to compensation by the cerebral cortex. The more active it is in taking over tasks, the milder the slowness of movement and the better the thinking. Doctors have long suspected that such a mechanism of compensation exists, but it has now been demonstrated for the first time.

The conclusions are based on a study in 353 people with Parkinson's and 60 healthy volunteers. They all took a test while in an MRI scanner. The test was a kind of computer game, where participants had to make both easy and difficult choices, which demands a lot from the brain. The researchers could use the MRI scanner to identify [brain regions](#) that were active during the game. They expected that making difficult choices stimulates compensation, and that the deployment of compensation differs between people.

First, they saw that the [brain structure](#) that strongly depends on

dopamine, the basal ganglia, is indeed damaged and shows much less activity in people with Parkinson's than in healthy volunteers. The [basal ganglia](#) lie deep in the brain, below the cerebral cortex. This brain area allows people to move and think smoothly. Hence, damage in this area leads to slowness of movement and thinking in Parkinson's.

Reinforcing compensation

It was also found that in people with Parkinson's there is a very clear relationship between the severity of symptoms and activity in the cerebral cortex.

Ph.D. candidate Martin Johansson says, "People with [mild symptoms](#) showed much more activity in the cerebral cortex, especially in areas that are involved in controlling movement. These areas were even more active than in healthy volunteers, which demonstrates their compensatory role. In patients with [severe symptoms](#), on the contrary, the cerebral cortex was much less active than in healthy volunteers."

This discovery offers new leads for treatment and lifestyle. "In Parkinson's we solve the dopamine deficiency with drugs. But with these new findings we are now going to look much more at how we can strengthen that compensation by the cerebral cortex," says Rick Helmich, neurologist at Radboudumc. "We saw in a previous study that exercising three times a week helps against symptoms, and prevents shrinkage of the cerebral [cortex](#). Thanks to the current study, we know why that [cerebral cortex](#) is so important."

The paper is published in the journal *Brain*.

More information: Martin E Johansson et al, Clinical severity in Parkinson's disease is determined by decline in cortical compensation, *Brain* (2023). [DOI: 10.1093/brain/awad325](https://doi.org/10.1093/brain/awad325)

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