

Brain stimulation may improve cognitive performance in people with schizophrenia

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Functional magnetic resonance imaging (fMRI) and other brain imaging technologies allow for the study of differences in brain activity in people diagnosed with schizophrenia. The image shows two levels of the brain, with areas that were more active in healthy controls than in schizophrenia patients shown in orange, during an fMRI study of working memory. Credit: Kim J, Matthews NL, Park S./PLoS One.

Brain stimulation could be used to treat cognitive deficits frequently associated with schizophrenia, according to a new study from King's College London.

There is currently a lack of effective treatments and an urgent need for new interventions to address these problems in short-term memory and decision making, which are often severely impaired in people with schizophrenia. This can make it difficult for them to adequately plan, sustain necessary focus and attention, and remember information, which has a significant impact on day-to-day life.

These so-called cognitive deficits are not addressed by current antipsychotic medications, which only treat more widely recognised symptoms such as delusions and hallucinations. Researchers are therefore increasingly looking towards novel interventions and 'neuromodulation' has emerged as a promising new technique that can physically alter and improve the brain's functioning.

In the study, published today in *Brain*, the researchers set out to use one particular form of neuromodulation - transcranial direct current stimulation (tDCS) - to see if they could undo some of these cognitive deficits in 28 people with schizophrenia. tDCS applies a small, painless electrical current across the brain through two electrodes applied to the scalp. Previous research has shown that this can improve the 'plasticity' of brain cells, making them more amenable to new inputs or training; in other words, it may make it easier for the brain to learn.

The researchers applied tDCS with tasks which specifically tapped into 'working memory' and '[executive functioning](#)': the principle was that 'training' the brain in regions that are typically poorly performing in schizophrenia would be enhanced by the [brain stimulation](#) technique. An improvement in [cognitive performance](#) was seen in those who had tDCS (and not in participants who received a 'sham' intervention), but only 24 hours after the brain stimulation was applied. This suggests that any changes in the brain and [brain cells](#) induced by neuromodulation may take some time to occur.

The researchers also ran brain imaging analyses to determine what was happening in the brain as these changes occurred. They found that tDCS was linked with changes in brain activity in regions associated with working memory and executive functioning, as well as in the cerebellum, a part of the brain increasingly recognised as important in learning.

Although an early study into neuromodulation and schizophrenia, this research is the first to suggest that tDCS could improve cognitive performance by changing activity in the brain. The study had a relatively limited sample size, so a larger, randomised controlled trial is now required to replicate these findings.

Dr Natasza Orlov, first author from the Institute of Psychiatry, Psychology & Neuroscience (IoPPN) at King's College London, said: "It's critical that we address some of the cognitive deficits seen in people with schizophrenia, as these determine how people do in real world settings, such as work and relationships. Anything that could positively address these could be incredibly helpful to our patients and their families."

Professor Sukhwinder Shergill, senior author from the IoPPN at King's College London, said: "Our study is the first of its kind and confirms that tDCS may help with some aspects of cognitive deterioration in patients with [schizophrenia](#). Given the lack of treatments in this area, this is enormously important. Our [brain](#) imaging data is also helping to understand how this is happening, which will support future research in this field."

Provided by King's College London

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