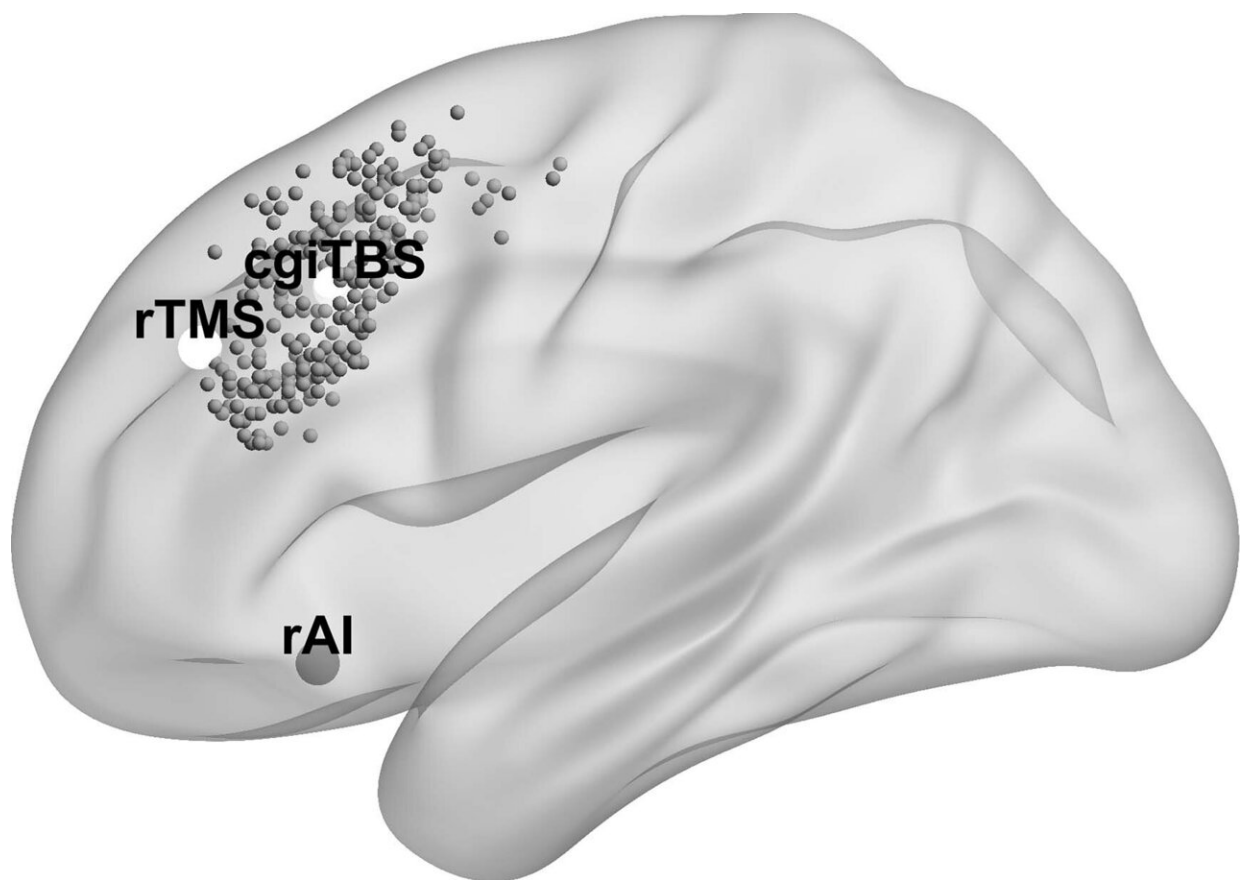


# Novel MRI technique found to improve the lasting effects of treatment for severe depression

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Sites of TMS stimulation. Credit: *Nature Medicine* (2024). DOI: 10.1038/s41591-023-02764-z

A major clinical trial has shown that by using MRI and tracking to guide the delivery of magnetic stimulation to the brains of people with severe depression, patients will see their symptoms ease for at least six months, which could vastly improve their quality of life.

The results of the trial, published in [\*Nature Medicine\*](#), found that on average, participants showed substantial improvements in the severity of their [depression](#), anxiety and thinking with better function and quality of life over 26 weeks with MRI neuronavigated Transcranial Magnetic Stimulation (TMS). This was a substantial increase on the previous reported improvements lasting only 1-3 months.

The BRIGHtMIND randomized controlled trial was led by experts at the University of Nottingham and hosted by Nottinghamshire Healthcare NHS Foundation Trust. It involved five centers across England (Nottingham, Camden and Islington, Newcastle, Northampton and Oldham).

## **Transcranial magnetic simulation (TMS)**

TMS is an [outpatient treatment](#) where people have powerful magnetic pulses delivered to the left side of their head just in front of the temporal area of the scalp. The person is conscious and has 20 sessions over a four-to-six-week period.

The method has been used since the 1980s to treat people with severe depression, but by targeting the precise area of the brain where stimulation is thought to be helpful, we now have evidence for a more longer lasting benefit of this treatment.

Major depression is the leading cause of disability lost years worldwide (WHO, 2017), and suicide from depression is the biggest killer in people aged between 15–49. Antidepressants and therapy delivered as first or

second-line treatments help two-thirds of people with depression, but the remaining third have treatment-resistant depression (TRD). This is defined as a lack of response to two courses of antidepressants.

The aim of the trial was to look at whether the effects of using TMS could be extended to at least six months, which would mean that patients with TRD who respond to the treatment might only require one to two courses of treatment each year to remain relatively well and free from symptoms of depression.

## **Neuronavigation**

The trial, which is the first of its size in the world to look at outcomes at six months, suggest this might be achieved using functional MRI with TMS to define the exact area of the brain to hit. MRI is not normally used to deliver this treatment.

The team used neuronavigation, a computerized tracking system using light to deliver the TMS, which is a way of precisely pinpointing the area of stimulation so that the same area is targeted at all 20 treatment sessions.

"Ideally when people come for a TMS session, they would sit in the exact same place, but this is rarely going to happen. This method uses light from both ear lobes and the top of the nose to measure the stimulation point from the first time a patient has the treatment. The MRI personalizes the site of stimulation and then neuronavigation makes sure the same site is being stimulated at each treatment session," said Richard Morriss, Professor of Psychiatry in the School of Medicine and Lead for the Center for Mood Disorders at the Institute of Mental Health.

"This reduces the variability in stimulation at each session. Since the

magnetic pulse can be focused, there are usually only minor short-lasting side-effects, and the person can return to their [daily activities](#) immediately on return from the hospital."

A total of 255 participants took part in the trial, all completing 20 TMS sessions. Patients already in specialist mental health services were recruited, and both Primary Care trusts and GPs were approached, with all participants having to be referred by their GP to take part.

## **Substantial improvement in quality of life**

Over two-thirds of participants responded to the treatment, with a third showing 50% improvement in terms of their symptoms and a fifth managing to move into remission and stay there.

"Given these patients are people who have not responded to two previous treatment attempts and have been ill for an average of seven years, to get such a significant response rate and a fifth who have a sustained response is really encouraging," said Professor Morriss.

He adds, "Patients who responded to the treatment could stay relatively well compared to how they were previously, with as little as one or two treatments a year. The changes we saw were substantial, not only in reducing their depression symptoms, but they were large enough to improve concentration, memory, anxiety and subsequently their quality of life. The results have already persuaded three NHS Mental Health Trusts, including Nottinghamshire Healthcare NHS Foundation Trust, to routinely offer new TMS services for treatment-resistant depression."

One of the participants of the trial said, "It has been a privilege to work alongside the research and clinical teams and feel that you are making an important contribution to such a groundbreaking study from a patient perspective. The next challenge is to make transcranial magnetic

stimulation a standard and universally available treatment option for difficult to treat depression."

Professor Danny McAuley, Scientific Director for NIHR Programs, said, "These are important findings showing this novel technique can hugely benefit patients with [severe depression](#) which has not responded to other treatments."

**More information:** Richard Morriss et al, Connectivity-guided intermittent theta burst versus repetitive transcranial magnetic stimulation for treatment-resistant depression: a randomized controlled trial, *Nature Medicine* (2024). [DOI: 10.1038/s41591-023-02764-z](https://doi.org/10.1038/s41591-023-02764-z)

Provided by University of Nottingham

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