

# knowledge snapshot



## A review of non-invasive brain stimulation as a treatment for gambling disorder

### What this article is about

Between 1.3 and 7.7% of people suffer from gambling disorder (GD). GD can cause health, economic, and social harms to people who gamble and their families. However, there are still few evidence-based treatments for GD. Impaired decision-making contributes to GD. For example, people with GD will often choose immediate rewards, even if they are of less value. People with psychological impairments or negative coping strategies may have impaired decision-making, making them vulnerable to GD. Certain medications can also make people more vulnerable to GD.

Non-invasive brain stimulation (NIBS) involves passing magnetic or electric currents through the scalp. These currents can change the neural activity in specific regions of the brain. There are two types of NIBS: Transcranial Magnetic Stimulation (TMS) and transcranial Direct Current Stimulation (tDCS). When TMS or tDCS are applied to certain regions of the brain, they can change dysfunctional brain circuits. So, these techniques could help treat dysfunctions like the impaired decision-making that contributes to GD.

This paper reviewed studies that used TMS or tDCS on people with GD. The authors also looked at studies on people with Parkinson's Disease, since their medications can make them vulnerable to GD.

### What was done?

The authors searched for studies on three databases (PubMed, Scopus, Web of Science). They searched for studies on gambling that had at least one NIBS term (e.g., "Transcranial Magnetic Stimulation", "TMS", "tDCS", "transcranial Direct Current Stimulation").

### Why is this article important?

Gambling disorder affects many people, but there are still few treatments for it. Non-invasive brain stimulation (NIBS) is a potential treatment. There are two types of NIBS: Transcranial Magnetic Stimulation (TMS) and transcranial Direct Current Stimulation (tDCS). This paper reviewed 27 studies that tested whether TMS and tDCS improved gambling-related decision-making in people with gambling disorder. Most studies targeted the dorsolateral prefrontal cortex (DLPFC) which is involved in decision-making. tDCS on the DLPFC improved scores on gambling, impulsivity, and risk-taking. TMS that increased activity in the DLPFC also improved scores for gambling behaviours and cravings. Thus, increasing activity in the DLPFC with tDCS or TMS may be effective in treating gambling disorder.

This search found 101 unique studies. The authors screened these studies to ensure they were original studies and written in English. They also excluded studies where participants had other psychiatric disorders, or alcohol or substance use disorders. Finally, they excluded studies that did not include both healthy participants and those with GD. Twenty-seven studies met all the criteria.

The authors recorded the following information for each of the 27 studies:

- The frequency, duration, and intensity of the treatment sessions
- The brain areas that were targeted
- Changes in gambling cravings or behaviour
- Changes in risk-taking or reward preferences

## What you need to know

Most studies targeted the dorsolateral prefrontal cortex (DLPFC) of the brain. The DLPFC is involved in planning, inhibition, and reasoning processes.

tDCS passes electric currents from a cathode on one area of the scalp to an anode on another area. Eight tDCS studies had the anode on the right DLPFC and the cathode on the left. One of these studies found that 20 sessions of tDCS improved scores on the Iowa Gambling Task and the Wisconsin Card Sorting test in patients with GD. Other studies found better performance on the Games-Howell test or other risky choice tasks. One single-case study switched the position of the anode and cathode for half of the sessions. It found reduced impulsivity and gambling cravings. Three studies targeted different brain regions and found improved decision-making. But, one study found improved performance on the Iowa Gambling Task in women although not in men.

TMS uses magnetic pulses on the scalp to target specific brain regions. These pulses can be excitatory (increase brain activity) or inhibitory (decrease brain activity). Two studies used 20 sessions of excitatory TMS on the left DLPFC and found it reduced gambling cravings and gambling behaviour. One study found one session of excitatory TMS reduced cravings but not gambling symptoms. Four studies used 20 sessions of inhibitory TMS on the DLPFC and found no improvement in gambling measures.

One study looked at tDCS of the DLPFC in patients taking medication for Parkinson's Disease. It found improved decision-making and impulsivity scores. One single-case study found one session of TMS reduced gambling symptoms in a patient.

## Who is it intended for?

This review is intended for people researching treatments for problem gambling. The authors suggest that future studies test NIBS interventions in controlled clinical settings. This could help establish evidence-based NIBS treatments for GD and other addictions.

## About the researchers

**Mauro Pettorruso, Andrea Miuli, Chiara Di Natale, Chiara Montemitto, Giacomo d'Andrea, Giovanni Martinotti, and Massimo di Giannantonio** are affiliated with the Department of Neuroscience, Imaging and Clinical Sciences at the G. d'Annunzio University in Chieti, Italy. **Francesca Zoratto** is with the Center for Behavioral Sciences and Mental Health at the Istituto Superiore di Sanità in Rome, Italy. **Luisa De Risio** is with the Department of Psychiatry at ASL Roma 5 in Colferro (Rome), Italy. See the original article for complete information on author affiliations. For more information about this study, please contact Andrea Miuli at [andreamiuli@live.it](mailto:andreamiuli@live.it).

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## About Gambling Research Exchange (GREO)

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