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IIT Mandi uses mathematical models to study effects of non-invasive brain simulation methods

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Given the important nature of the brain, the use of electricity on it can be dangerous if outcomes are not known



A collaborative research team comprising scientists from the Indian Institute of Technology (IIT) Mandi, National Brain Research Centre, India and University at Buffalo, USA, performed mathematical simulation studies on non-invasive brain simulation techniques.

Transcranial electrical stimulation (tES) is a non-invasive brain stimulation technique that passes an electrical current through sections of the brain to study or alter brain function.

Three types of non-invasive brain stimulation – transcranial direct current stimulation (tDCS), transcranial alternating current stimulation (tACS) and transcranial oscillatory current stimulation (tOCS) – were modelled to investigate their physiological effects. The initial tES effects on the blood vessels were also found to occur via the perivascular space - a fluid-filled space surrounding the blood vessels in the brain.

“Our study can help brain- and neuro-specialists plan patient specific restorative neurorehabilitation activities for stroke, post traumatic brain injury, mild cognitive impairment, dementia, and other neuropsychiatric disorders,” said the lead researcher. Such a mathematical model based quantitative analysis would help in individualized therapeutic protocols for neuropsychiatric disorders. The team has planned experimental studies that involve blocking of various pathways to validate their modelling results.