Brain stimulation promises 'long-lasting' maths boost

Applying high-frequency electrical noise to the brain can boost maths skills up to six months later, say Oxford University researchers.

A small study in Current Biology suggests the brain stimulation technique makes neurons function more efficiently.

It could help those suffering with neurodegenerative illness, stroke or learning difficulties.

An expert said the technique could have "real, applied impact."

Transcranial random noise stimulation (TRNS) involves applying random electrical noise to targeted areas of the brain by placing electrodes on the surface of the scalp.

It is a relatively new method of brain stimulation which is painless and non-invasive.

Fifty-one students from the University of Oxford, split into two groups, were asked to perform two arithmetic tasks over a five-day period. Only one group received TRNS while performing the tasks each day.

The tasks tested participants' abilities for calculation (eg 32-17+5=20) and rote learning (committing times tables such as 4x8=32 to memory).

Dr Roi Cohen Kadosh, study author from the department of experimental psychology at the University of Oxford, said the noise stimulation group showed improvements in cognitive and brain functions compared with the control group.

"Performance on both the calculation and rote learning tasks improved over the five days, and the former improvements were maintained until six months after training.

"Our neuro-imaging results suggested that TRNS increases the efficiency with which stimulated brain areas use their supplies of oxygen and nutrients."

There were no significant differences in performance between the groups at the start of the study yet TRNS was found to improve the speed of learning for both calculation and rote learning tasks.

Six months later, when participants were contacted again and asked to solve calculations, researchers found that the group which had received five days of transcranial random noise stimulation showed "superior long-term performance, compared to sham controls".

Potential

Cohen Kadosh and his colleagues had previously shown that another form of brain stimulation could make people better at learning and processing new numbers.
But he said transcranial random noise stimulation could help more people because it had the potential to improve the ability to add, subtract or multiply a string of numbers in your head - not just new number learning.

"Mental arithmetic is a more complex and challenging task, which more than 20% of people struggle with," the study said.

A learning disorder, called dyscalculia, which is characterised by struggles with arithmetic is thought to affect around 5%-7% of the population. Similar problems affect people suffering from neurodegenerative disease or stroke.

Cohen Kadosh added that it was important to identify any downsides of this and other similar forms of transcranial electrical stimulation to ensure that boosting one cognitive ability did not lead to damage in another.

Looking ahead, he said he hoped these stimulation techniques would one day be used in the clinic, the classroom and even at home.

Dr Michael Proulx, senior lecturer in psychology at Bath University, said the study findings were important and exciting.

"This study reinforces the idea that brain stimulation enhances cognitive training. It is not some panacea that just makes the brain work better overall, but it helps boost a learner's effort.

"The results also clarify that stimulation does not only improve specific learning, where practice might make perfect, but also generalised learning, where practising one skill can transfer to new situations."

He added: "These two findings suggest that this technique could have real, applied impact."

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