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Scientists boost perception using rhythmic transcranial magnetic stimulation

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Researchers at the University of Glasgow and University College London (UCL) have, for the first time, enhanced visual perception through rhythmic transcranial magnetic stimulation (rTMS) of the brain.

The team led by Dr. Gregor Thut in the Center for Neuroimaging at the Institute of Psychology & Neurosciences at Glasgow together with colleagues at UCL have shown that rTMS boosts the perception of specific visual stimuli among competing information, when applied at specific frequencies.

All brain processes, including vision, hearing and memory, produce electrical signals – or brainwaves – with specific frequencies.

rTMS involves generating weak electrical currents across the head which can be used to study brain function and connections by generating activity in specific areas.

Previous research using magnetoencephalography (MEG) was consulted to identify the frequency of electrical signals used in visual perception which allowed the scientists to generate rTMS patterns of the same frequency to boost the natural function.

Dr. Vincenzo Romei of the Wellcome Trust Center for Neuroimaging at UCL and first author of the publication said: “Visual scenes are often crowded with events, but only some of these competing events can be perceived, prioritised for instance through expectations.

“Imagine entering into a crowd of people at a party, while looking for a friend. You will most likely not notice every single person, but will recognize your friend. How the brain exactly selects such information is still unknown.

“We have shown that rTMS could provide a powerful new tool for frequency-specific interventions in perception and brain function.”

The research involved asking 12 participants to look at a computer screen where a large letter would be displayed – an H, S or D. The large letter itself was made up of smaller letters – again H, S or D. These letters were hence made up of competing information at the local versus global level.

Participants were timed as they were asked to identify a target letter – either the larger letter at the global level, or the constituent letters at the local level – while simultaneously undergoing rTMS.

The results showed that giving bursts of rTMS at a beta-frequency (20 Hertz) to the right parietal lobe of the brain – an area known for its implication in visual selection –enhanced local visual processing resulting in better identification of the target letter, while stimulation at theta-frequency (5 Hertz) enhanced global visual processing.

Dr. Thut said: “We enhance perception using rTMS at biologically relevant frequencies. By showing that perception is shaped through frequency-specific intervention, we are getting closer to understand what is driving our perception”.

“Frequency-specific interventions have numerous potential applications such as improving memory and sleep.”

More information: The research is published in the latest edition of

Current Biology.