

Cognitive Function

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[Transcranial magnetic stimulation. Applications in cognitive neuroscience]

[Article in Spanish]

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OBJECTIVE: In this review we trace some of the mayor developments in the use of transcranial magnetic stimulation (TMS) as a technique for the investigation of cognitive neuroscience. Technical aspects of the magnetic stimulation are also reviewed.

DEVELOPMENT: Among the many methods now available for studying activity of the human brain, magnetic stimulation is the only technique that allows us to interfere actively with human brain function. At the same time it provides a high degree of spatial and temporal resolution. Standard TMS applications (central motor conduction time, threshold and amplitude of motor evoked potentials) allow the evaluation of the motor conduction in the central nervous system and more complex TMS applications (paired pulse stimulation, silent period) permit study the mechanisms of diseases causing changes in the excitability of cortical areas. These techniques also allow investigation into motor disorder, epilepsy, cognitive function and psychiatric disorders. **CONCLUSIONS:** Transcranial magnetic stimulation applications have an important place among the investigative tools to study cognitive functions and neurological and psychiatric disorders. Even so, despite the many published research and clinical studies, a systematic study about the possible diagnostic value and role in neurocognitive rehabilitation of TMS testing need to be realized to offer new possibilities of future applications.

Neuroreport. 2005 Nov 7;16(16):1849-1852.

Repetitive transcranial magnetic stimulation over the right dorsolateral prefrontal cortex affects strategic decision-making.

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Although decision-making is typically seen as a rational process, emotions play a role in tasks that include unfairness. Recently, activation in the right dorsolateral prefrontal cortex during offers experienced as unfair in the Ultimatum Game was suggested to subservise goal maintenance in this task. This is restricted to correlational evidence, however, and it remains unclear whether the dorsolateral prefrontal cortex is crucial for strategic decision-making. The present study used repetitive transcranial magnetic stimulation in order to investigate the causal role of the dorsolateral prefrontal cortex in strategic decision-making in the Ultimatum Game. The results showed that repetitive transcranial magnetic stimulation over the right dorsolateral prefrontal cortex resulted in an altered decision-making strategy compared with sham stimulation. We conclude that the dorsolateral prefrontal cortex is causally implicated in strategic decision-making in healthy human study participants.

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Recharging cognition with DC brain polarization.

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Electrical direct current (DC) has been applied to the human head throughout history for various reasons and with claims of behavioral effects and clinical benefits. This technique has recently been rediscovered and its effects validated with modern quantitative techniques and experimental designs. Despite the very weak current used, DC polarization applied to specific brain areas can alter verbal fluency, motor learning and perceptual thresholds, and can be used in conjunction with transcranial magnetic stimulation. Compact and safe, this old technique seems poised to allow major advances cognitive science and therapy.