

# Controlled clinical trial of repeated left prefrontal transcranial direct current stimulation in patients with chronic minimally conscious state

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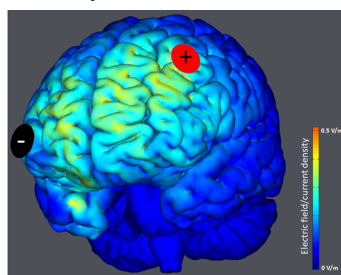
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## OBJECTIVES

In this randomized double blind sham controlled cross-over study, we aimed to assess the effects of repeated transcranial direct current stimulation (tDCS) sessions in level of consciousness in chronic patients in minimally conscious state (MCS), as previously described<sup>1</sup>.

Figure 1. The transcranial direct-current stimulation technique used in this study involves placing two electrodes on the patient's head: one on the left front side (red) and one on the right side on the temple (black). The electric field induced in the grey matter is shown in yellow.



## METHODS

We enrolled 16 patients in chronic MCS (>3months post insult; mean age: 47±16 years; 9 men; interval since insult: 85±100 months; 11 traumatic brain injured patients). We delivered two sessions of repeated (5 days of stimulation) tDCS, either anodal or sham in a randomized order (Figure 2). We stimulated the left dorsolateral prefrontal (DLPF) cortex (Figure 1) with a current of 2 mA during 20 minutes. Consciousness was assessed by the French adaptation of the Coma Recovery Scale Revised<sup>2</sup> (CRS-R) before and after each stimulation as well as one week after the end of the session in order to assess the long term effect of tDCS.



Figure 2. CRS-R=Coma Recovery Scale-Revised; tDCS=transcranial direct current stimulation. Sessions 1 and 2 are randomly real or placebo sessions. █ 20 min tDCS

## RESULTS

We observed a treatment effect after 5 days ( $p=0.013$ ; effect size=0.43) of tDCS as well as one week later ( $p=0.002$ ; effect size=0.57; Figure 3). We found a linear evolution for the tDCS session ( $p<0.001$ ) while no evolution was found for the sham session ( $p=0.64$ ). We identified 9 responders (53%; i.e. patient showing a new sign of consciousness after the real session that was not present before or during the sham session). Four patients responded after the first stimulation and 5 other patients responded after 2, 3 or 4 days of stimulation. No side effect (e.g. epilepsy, sign of pain, drowsiness) was reported.

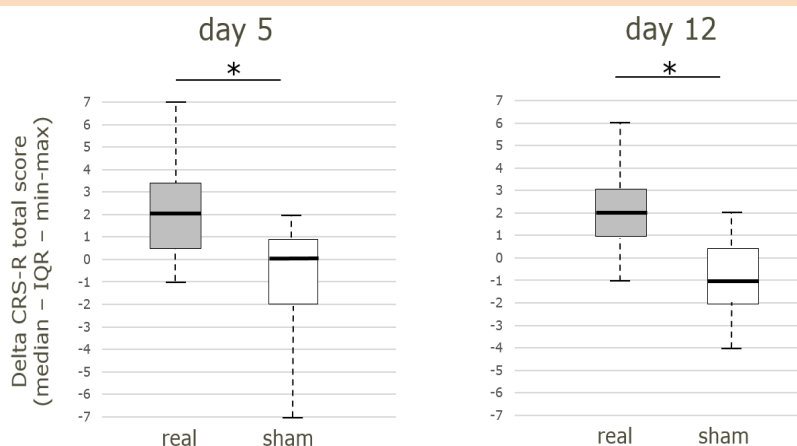


Figure 3. Boxplot of real (in grey) and sham (in white) tDCS at day 5 and day 12 (i.e., one week after the end of the stimulation).

## CONCLUSION

Our results demonstrate that repeated (5 days) anodal left DLPF tDCS is safe and might improve signs of consciousness in about half of patients in MCS and the effects seem to last one week after the end of the stimulations. It is important to note that the first session is not predictive for a future positive effect of tDCS efficacy.

### REFERENCES

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