Discussion  The increase in left M1 MEP amplitude and reduction in CSP and SICI during and after 20 min of right M1 a-tDCS is most likely to be attributed to a reduction in interhemispheric inhibition that is modulated by a-tDCS during the performance of an active task. Our findings may have significant implications for stroke rehabilitation whereby the application of a-tDCS on the contralateral M1 during neurorehabilitation of the paretic limb may be beneficial for inducing neuroplasticity of the ipsilesional M1 to improve motor function.

Keywords Transcranial direct current stimulation; Primary motor cortex; Excitability; Transcranial magnetic stimulation; Stroke

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

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Study of the effects of a 5-day brain stimulation with Paired Associative Stimulation (PAS) against placebo in 28 hemiplegic patients

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Objectives The Paired Associative Stimulation (PAS) is a non-invasive brain stimulation technique combining an electrical peripheral stimulation and a magnetic cortical stimulation. Applied on the wrist extensor muscles, one session induced changes in cortical excitability. We studied the effects of a repetition of 5 PAS sessions against placebo.

Material and methods This is a prospective, randomized, double-blind against placebo study. One session consisted in applying an electrical peripheral stimulation on the wrist extensor muscle followed by a 25-ms later magnetic cortical stimulation over the wrist area, at a 0.1-Hz frequency during 30 minutes, the patient receiving 180 paired stimuli. In the SHAM group, the patient received the electrical peripheral stimulation and a SHAM magnetic stimulation. One session was applied every day during 5 days. The changes in area of the motor-evoked potential (MEP), reflecting the changes in cortical excitability, and motor changes studied by the Fugl-Meyer score were assessed at the end of the 1st and 5th session, 3, 5 and 7 days after the end of the 5 days session.

Results Twenty-eight patients were included (19 men, mean age: 49.9 ± 13.5 years), with stroke from 10.0 ± 5.1 weeks. Only data from 24 patients were exploitable, 13 patients being included in the PAS group. It was not found significant differences between the two groups regardless of the time after stimulation, or the electrophysiological parameters, neither the motor scores. However, there is a greater MEP variability in the PAS group compared to the SHAM group. All patients (n = 5) for which PAS increased cortical excitability (DB-MEP > +200% D1-MEP) were those with a low initial level of cortial excitability.

Discussion The initial level of cortical excitability seems to play a key role of repeated sessions of PAS on the lasting effects on brain excitability. Our results confirm the importance of the initial level of neuronal activation in the cortical modulation induced by TMS.

Keywords Stroke; Transcranial magnetic stimulation; Cerebral plasticity

Disclosure of interest The authors have not supplied their declaration of conflict of interest.

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Study of motor and electrophysiological effects induced by the association of motor imagery exercises and Paired Associative Stimulation in 6 hemiplegic patients

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Objective Motor Imagery (MI) is a cognitive process of imagining a movement without actually doing it. This technique has demonstrated its benefits in the rehabilitation of hemiplegic patients. Non-invasive brain stimulation (NIBS) is still at a preclinical stage but has demonstrated their adjunct effect in the learning of a motor task. In this study, we studied the motor and electrophysiological effects of a session combining Paired Associate Stimulation (PAS), a technique of NIBS and MI exercises (PAS-MI).

Methods A prospective, randomized cross-over study where six patients were included (4 men, age = 44.5 ± 13.7 years; 5.7 ± 7.7 months post-stroke). They randomly underwent three 15-minute sessions of stimulation, one week apart: PAS-MI, PAS alone and ShamPAS associated with MI exercises (ShamPAS-MI). The PAS intervention consisted in an electrical stimulation of the hemiplegic extensor carpi radialis (ECR) associated with cortical magnetic stimulation over the wrist motor area. In MI condition, the patient was instructed to imagine extension of his hemiplegic wrist and in ShamPAS intervention, we used a SHAM probe. We compared the surface variation of the motor-evoked potential (MEP) of the ECR and the amplitude of active extension (AE) of the hemiplegic side obtained after each session.

Results Twenty-five minutes after the end of session PAS alone, an increase of MEP surface (+91% ± 150%) which reveals a higher cortical excitability associated with a slight motor improvement (AEa = 1.33 ± 3.14) was shown. A smaller facilitation was shown after sessions PAS-MI and ShamPAS-MI (+45.87 ± 134.32% and 44.85 ± 28.77%, respectively) and, in these cases, was not associated with motor improvement.

Conclusion The session PAS alone seems to induce motor improvement associated with increased cortical excitability not shown after the other two sessions. The combination of two types of stimuli seems to have less effect, perhaps because of the mechanisms regulating the homeostasis of brain plasticity. The results have to be confirmed on a larger sample.

Keywords Stroke; Transcranial magnetic stimulation; Cerebral plasticity

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Submental sensitive transcutaneous electrical stimulation reverses virtual lesion of the oropharyngeal cortex

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