Title:

HIGH DEFINITION TRANSCRANIAL DIRECT CURRENT STIMULATION (HD-TDCS) COMBINED WITH FUNCTIONAL MAGNETIC RESONANCE IMAGING (MRI) TO ASSESS THE INVOLVEMENT OF THE PRIMARY SOMATOSENSORY CORTEX IN NOCICEPTION

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Background. Non-nociceptive and nociceptive somatosensory stimuli activate a common set of brain areas including the primary and secondary somatosensory cortices (S1, S2), the insula and the anterior cingulate cortex (ACC). Yet, non-nociceptive and nociceptive somatosensory processing could differ in its hierarchical organization, especially the role of S1 as a primary target for the lemniscal pathway, but not for the spinothalamic pathway.

Aims. To assess how, in humans, the cortical processing of non-nociceptive and nociceptive inputs is dependent on the responsiveness of S1.

Methods. The intensity of perception and functional MRI responses to non-nociceptive (transcutaneous electrical stimulation of the superficial radial nerve) and nociceptive (laser stimulation of the hand dorsum) somatosensory stimuli delivered to the left and right hand were recorded before and after modulating left or right S1 excitability using 20 minutes of high-definition transcranial direct current stimulation (HD-tDCS) at 1 mA. Sham HD-tDCS was used as control.

Expected hypothesis. According to the assumed serial processing of non-nociceptive inputs from S1 to other brain regions, we predict that modulating S1 excitability will affect the fMRI response to non-nociceptive stimuli applied to the contralateral hand not only in S1, but also in S2, the insula and the ACC. Conversely, if nociceptive processing within these areas follows a more parallel organization (e.g. parallel spino-thalamo-cortical projections to both S1 and S2), modulating S1 excitability could have comparatively little or no effect on the responses to nociceptive stimuli in S2, the insula and the ACC.

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