New therapy for itch in the future

Chronic itch is a major and distressing symptom in dermatological diseases including atopic eczema and significantly impairs the patient's quality of life. In current, millions of people worldwide suffer from chronic itch. However, it is poorly treated. Thus, it is important to develop novel and effective antipruritic treatment.

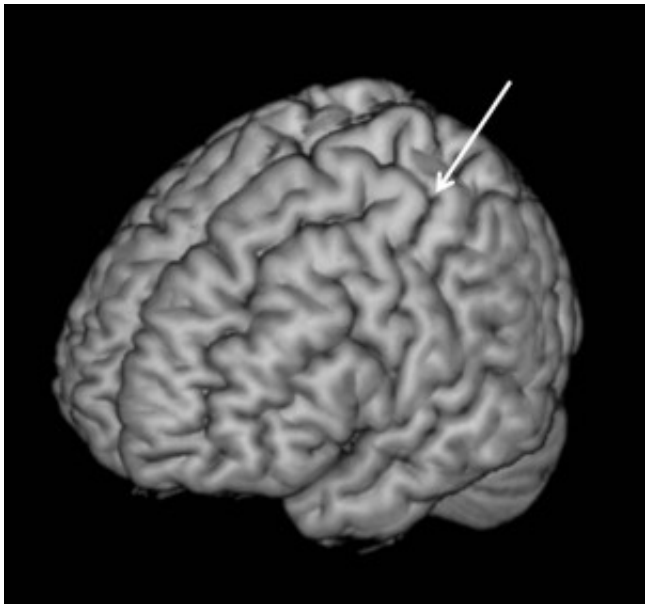

Fig. 1. The location of the sensorimotor area in the brain. MRI: MNI template brain (MRIcron, http://www.mccauslandcenter.sc.edu/mricro/mricron/).

Transcranial Direct Current stimulation (tDCS) is a safe, noninvasive, and little side effect method that can modulate neural activity in the brain by applying a weak electrical current from the scalp. Recently, this method has been used for treatments of several diseases including chronic pain, psychiatric disorders and neurological disorders as well as rehabilitation after strokes. However, no study has investigated the efficacy of tDCS intervention for itch relief. We focused on the phenomenon whereby the sensation of pain is inhibited by tDCS stimulation of the sensorimotor area of the cerebral cortex (Fig. 1), and evaluated the possibility of similar inhibitory effects of this method on the itch sensation. In our study, the itch sensation was experimentally induced on the forearm of healthy subjects using histamine. tDCS stimulation was applied while the subjects perceived the itch sensation.

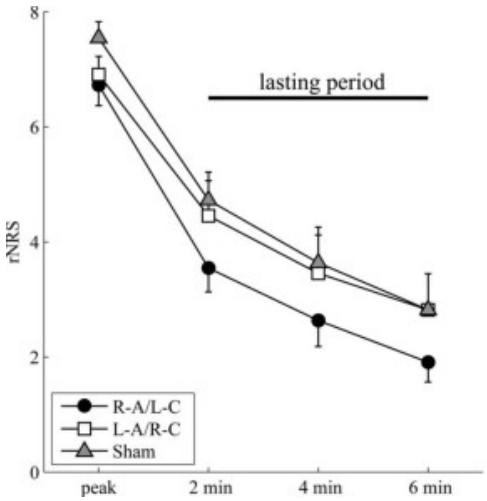

Fig. 2. Time-dependent changes in itch sensations with 2 min intervals from the peak intensity. © 2016, with permission from Elsevier.

As shown in Fig. 2, the itch sensation was significantly reduced during tDCS intervention over the sensorimotor area. A two-way repeated ANOVA (3 time points × 3 tDCS sessions) revealed a significant difference in scores among the time points ($F(2, 20) = 33.02$, $p < 0.001$) and tDCS sessions ($F(2, 20) = 3.63$, $p = 0.045$). Post-hoc tests revealed that the score of the R-A/L-C intervention was significantly lower than that of Sham ($p = 0.014$) 2 min after the peak intensity of itch was felt. rNRS: revised numerical rating scale, R-A/L-C: real tDCS stimulation with anodal and cathodal electrodes placed over the right and left sensorimotor area, respectively. L-A/R-C: real tDCS stimulation with anodal and cathodal electrodes placed over the left and right sensorimotor area, respectively. Sham: no tDCS stimulation (control). Reprinted from Clinical Neurophysiology, Volume 127, Issue 1, Nakagawa et al., transcranial direct current stimulation over the sensorimotor cortex modulates the itch sensation induced by histamine

This study first demonstrates that tDCS is a promising tool for itch relief. Future studies will identify stimulus conditions of tDCS intervention to induce clinically meaningful antipruritic effect.

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